

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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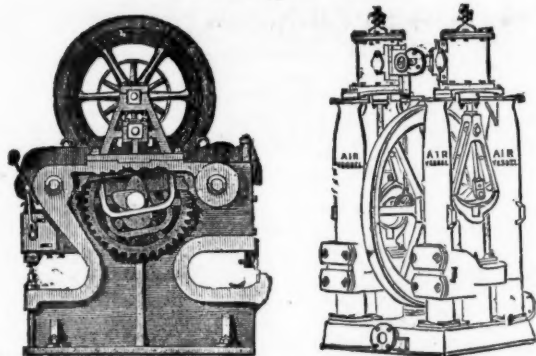
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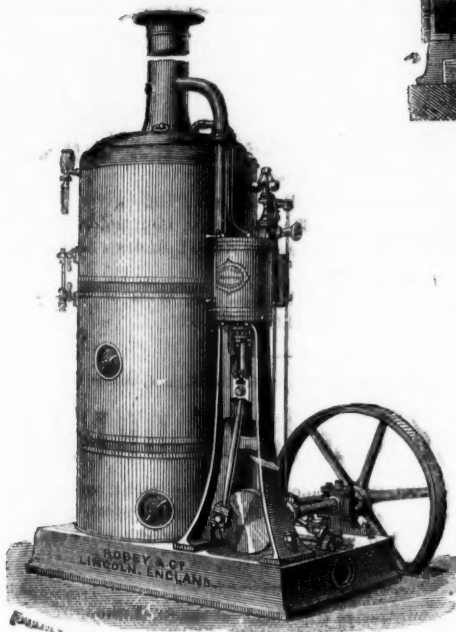
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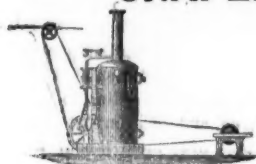
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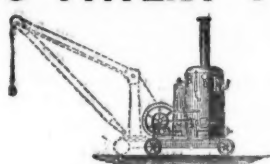


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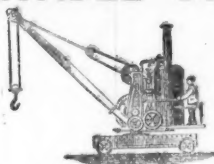
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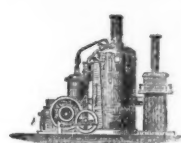
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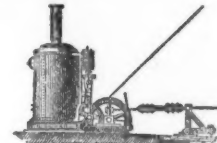
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WORKS:—REGENT'S CANAL DOCK, 602, COMMERCIAL ROAD EAST, LONDON, E. (Near Stepney Station.)

(2)

BELTING versus GEARING.

Of late years a great change has been gradually taking place in the Mills and Manufactories of Lancashire and Yorkshire by the substitution, betwixt the
Engines and Shafting, of Belting for Gearing, thus doing away with all noise and vibration, as well as wonderfully reducing the cost of repairs; and so manifest
are its advantages, that driving by Gearing will soon be the exception.

As a still greater improvement, we beg to submit
our Wrought-iron Drums (Rodgers's Patent), of
which we are the Sole Makers. Their special merits
may be briefly stated as follows:—

- 1.—These drums absorb less of the power of the engine in friction than any other mode of driving.
- 2.—Leather belts on these drums will drive considerably more than cast-iron ones, and the belts last much longer.
- 3.—These drums are not only considerably lighter in the larger sizes, but also infinitely stronger than cast-iron ones.
- 4.—In case of fire they suffer little damage. We have repaired many hundreds that have been in very serious fires, generally at about 25 per cent. on first cost.
- 5.—For MAIN DRIVING purposes they are invaluable, especially in case of a new mill, as they do not require such substantial and heavy building construction as is necessary in ordinary cases to withstand the constant vibration of gearing.



6.—The wrought-iron drums and belts are more easily and quickly fixed than gearing.

7.—Greater economy in steam power, as it requires less power to transmit the same effective force with belts than it does with gearing.

8.—Very much greater economy in subsequent repairs, as compared with gearing.

9.—The power is transmitted evenly, faithfully, and noiselessly, and without the vibration arising from defective or worn gearing.

10.—They require no cases for transport or shipment.

In support of the foregoing statements, we may say we have already supplied upwards of 20,000 of these Drums for use in Great Britain and Ireland, and have also exported them largely throughout the Continent of Europe, India, and the British Colonies.

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Lectures on Practical Mining in Germany.

CLAUSTHAL MINING SCHOOL NOTES.—No. CXVII *

BY J. CLARK JEFFERSON, A.R.S.M., WH. SC.,

Mining Engineer, Wakefield.

(Formerly Student at the Royal Bergakademie, Clausthal).

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SECTION V.

DAMS IN LEVELS AND SHAFTS.

The second division we have distinguished in wedge-dams, in which the dam forms a portion of a hollow sphere, has been well developed in the Freiberg Mines. The dam is generally executed about 6 ft. in thickness, and the radius on the front (or concave side) of the dam varies between 18 ft. and 24 ft., being the less the greater the water-pressure at the back of the dam. The radius to which the back side of the dam is formed is, of course, about 6 ft. longer—24 ft. to 30 ft.—than the radius of the front side, the two sides of the dam being concentric.

The place for the erection of the dam having been chosen, a prop is fixed tight in the level, from 18 ft. to 24 ft. in front of the dam, and the end of a long cord is fastened to a hook driven in the prop in a position to correspond with the centre of the supposed hollow sphere of which the wedge forms a part. This cord when stretched tight to the centre of the level where the dam is to be erected, should be normal with the general direction of the level in which the dam is being inserted. By means of this cord the sides, roof, and floor are dressed radially with respect to the above supposed hollow sphere, and their prolongations naturally coincide at the point where the cord is attached. This cord is afterwards used for keeping the contour of the front side of the dam perfectly spherical as the wedges are being built together. The ordinary form of the level (rectangular, trapezoidal, or oval, as the case may be) is retained in dressing the sides, &c., as causing the least amount of labour in dressing. The length of the dressed portion is made to exceed by 3 ft. or 4 ft. the thickness of the dam, so as to make allowance for an advance of the dam as the water-pressure begins to exert itself. This forward advance of the dam is much greater than might be at first supposed. At the Crown Prince Friedrich August Mine, Freiberg, where the dam, with 18 ft. radius on the concave (front) side resisted a head of water of 247 metres in height, the following advances of the dam were noticed—

After 7 min. to 8 min. the dam had advanced	2.8 in.
12 hours ditto ditto	13.2 in.
10 days ditto ditto	24.5 in.
25 months ditto ditto	25.8 in.
41 months ditto ditto	29 in.

when the advance ceased.

Whilst the sides are being dressed, the wedges of which the dam is to be built are carefully cut and numbered at the surface; the wedges being made to fit each other, all those in one row being made of the same height. The length of the wedges is, of course, the same as the intended thickness of the dam (about 6 ft.), except those intended to form the key-wedges in each row, which are somewhat longer, to admit of their being driven up when the building up of the dam has been completed. The front ends of the wedges are from 6 in. to 7 in. square, made from fir or pine or other soft wood, which readily admits of wedging. The wood should be well seasoned before use. The key-wedges and the wedges bearing against the floor, or roof, or sides are first cut and finished in the mine.

Before laying the wedges in position the dressed portion of the floor and sides is smeared over with red ochre. The bottom row of wedges are then cut and laid in position, beginning at the sides and proceeding towards the centre. A provisional key-wedge keeps the row tight, whilst each wedge is forced against the floor by blows of the mallet. On removing the wedges the red ochre marks indicate those portions of the wedges which require further dressing in order to ensure an accurate fit with the surface of the floor or sides. After a sufficiently accurate fitting of the wedges, including the permanent key-wedge, which is afterwards inserted (being measured to suit the space left in the centre), the floor is covered with a double thickness of well-tarred coarse or sack-linen, which is continued up both sides as the building up of the dam advances, enclosing the latter like a cloak. On this double thickness of linen the first row of wedges is now permanently laid. In a somewhat similar manner the second row of wedges is laid, with this difference—that only the two side wedges require dressing, the centre or key wedge being cut to suit after the others have been placed definitely in position.

In order to provide an outlet for the water, when the height of the dam prevents the water being carried away from the provisional dam in an open pipe, one of the wedges of the second row is made of larger section, the depth being so great that the top of this wedge is level with the third row of wedges. A hole from 2 in. to 4 in. in diameter, according to the quantity of water to be carried away, is bored through the wedge; the hole is made slightly conical, so as to be larger at the back side of the dam than at the front. This is done to facilitate the stopping up of this hole when the dam is completed. A long conical wooden plug is made to fit the hole from the back side, which can thus be readily made water-tight by driving the plug up with an ordinary mallet. A pipe or channel conducts the water from the provisional dam to the opening at the back side, and a pipe at the front end of the opening carries the water away from the immediate neighbourhood of the permanent dam. The wooden plug for stopping this outlet hole for the water is about 30 in. long, slightly larger than the conical section of the opening, and provided at the thicker end with a wrought-iron ring, to prevent the end being split, when the plug is being driven in.

At half the height of the dam the man-hole (for the egress of the workmen after wedging the back of the dam) is fixed. The man-hole is formed of a cast-iron pipe, cylindrical for the front half of its length (18 in. in diameter); the pipe gradually enlarges to the back, where the opening is 20 in. in diameter. The back end of the pipe is provided with a flange 1 in. in depth. The pipe is enclosed by two or three wedges, being to the half of its height bedded in one row, and covered over the upper half by the next row above. The corresponding hollows cut in the wood must be made to fit the outside of the man-hole cylinder very accurately. Before being placed in position the pipe is surrounded by well tarred linen.

The insertion of the wedges is continued in the above-mentioned manner till the last two or three rows, when the wedges are at first inserted only temporarily (like those in the floor) until they have been thus adjusted with rigorous exactitude to the contour of the roof and sides close to the roof. The roof is covered previous to the permanent insertion of the wedges, as all round, by a double thickness of well-tarred linen, which is temporarily attached to laths during the insertion of the wedges. One of the wedges in the topmost row but one is formed of such a section as to admit of a longitudinal hole, to the back end of which a pipe bent upwards, so as to reach the highest place in the roof, is attached. The object of this is to afford exit to the air, which would otherwise be compressed behind the dam next to the roof. This hole is afterwards plugged up from the front side as soon as the water begins to issue from it.

When the dam has thus been built up it is wedged tight on the back (convex) side. This is done by driving the wedges into the wood itself after the key-wedges have been driven up as tight as possible by blows from a heavy wooden mallet. The wedges are lenticular or lozenge shaped in section, $1\frac{1}{2}$ in. thick, by 3 in. to 4 in. broad. The first wedges are made of soft (pine) wood, about 30 in. in length, and are driven in an inclined position relative to the joints of the wedges. Near the floor, roof, sides, and the man-hole cylinder two or three rows of wedges are driven in pretty

close to each other. The wedging begins near the top, and proceeds downwards. After this similar shaped wedges, 18 in. long by 1 in. thick, and 2 in. to $2\frac{1}{2}$ in. broad, made of harder wood, are then inserted; and, lastly, especially in the lower part of the dam, iron wedges, 18 in. long, by 3 in. broad, and 1 in. thick, are driven in wherever it appears desirable. The back side of the dam is covered over with a composition containing tar, soap, pitch, linseed oil, and unslacked lime. In order to render the joint near the floor additionally tight the space between the bottom of the dam and a sill about 2 in. in height, placed a few inches from it, is stamped tight with oakum previously dipped in tallow.

The conical stopper for the man-hole is made of beech wood, about 3 ft. 6 in. long, and slightly larger than the conical part of the man-hole. The back end of the stopper has three wrought-iron hoops, and about the middle of its length a broad groove, $\frac{1}{2}$ in. deep and $2\frac{1}{2}$ ft. wide, is cut round the stopper. This groove is filled with spun yarn which has previously been soaked in tallow, which when the stopper is drawn tight up swells or rather is forced into a narrower but deeper ring, which projects 1 in. above the general contour of the stopper, and covers the opening or joint between the stopper and the back end of the man-hole cylinder. A hole is bored through the centre of the stopper, through which a long rod, $1\frac{1}{2}$ in. in diameter passes, having a hook at the front end, and being held at the back end by means of a large nut and washer. The stopper, which is first soaked in warm tallow, is drawn tight by means of a chain attached to the hook, the opposite end of the chain being attached to a windlass. After the water has been allowed to press against the back of the dam for a short time the chain can be slackened and removed.

BRICKWORK DAMS.

These may be divided into two classes—those which resist the pressure of the water chiefly by their mass, and those which are built in the form of an arch. In this last division we may also distinguish those in which the arch forms part of a cylindrical surface, with the axis vertical, horizontal, or inclined, to suit the local requirements, and those in which the arch forms part of a spherical shell. With regard to the first class—those which resist the water pressure entirely or practically so by their mass, little requires to be said. The principal point to be attended to is the connection between the brickwork and the surrounding strata, since there will be no difficulty in building up the dam in a water-tight manner. The bricks are steeped in water preparatory to being laid in position, and hydraulic lime is generally used. It is very usual to insert one or more walls of concrete in the dam. Since it is not necessary to retain access to the back side of the dam for wedging, &c., as in the case of wooden dams, man-holes are unnecessary, also the air pipe usually inserted in wooden dams. A water pipe of sufficient dimensions to carry the water away as fast as it runs to the back side of the dam is necessary to let off the water (so as to keep off the water pressure, which is sometimes enormous) until the dam has been finished and the mortar has hardened.

An example of this kind is given in Ponson's *Traite de l'Exploitation*, from the Grand Traits de l'Agrappe Collieries, at Framerie, near Mons. The dam is erected in a cross drift, the point chosen for erecting the dam being where the drift intersects a highly inclined coal seam, about 4 ft. thick. The dam has a total length, or rather thickness, of 5-40 metres—17 ft.; the gallery is excavated 2 ft. 4 in. deep in the roof and floor where the dam is inserted. The first part of the dam next the water consists of three thicknesses of brick, the floor being cut in a stepwise fashion, so that the last thickness is footed two bricks deeper than the first. At a distance of 20 in. from this first part the next portion of the brickwork (two bricks in thickness) is built, the space between the two being filled with an hydraulic concrete. The roof for this portion is cut inclined upwards. The rest of the brickwork is now built up terrace wise, the step arrangement running upwards towards the back side of the dam. The front end of the wall is fitted at the foot square with the floor, at the roof in a stepwise arrangement, so that the last three thickness of brick diminish in height one brick successively. The water pipe for carrying off the water during the building of the dam is provided with several flanges, so that it can be built firmly into the dam. This dam was provided with an air pipe. Four weeks are allowed for the hardening of the mortar after the dam is finished before the water pipe is stopped up. This dam resisted a head of water of upwards of 320 feet.

IRON AND STEEL INSTITUTE.

The annual general meeting of the members of the Iron and Steel Institute was this year an unusually interesting one, the incoming president—Mr. Edward Williams, of Middlesbrough—being so complete a master of all the details of manufacture that he was enabled in his inaugural address to offer facts which will prove of the utmost pecuniary value to every member. The present is essentially the age of steel, and consequently steel received by far more attention than the kindred metal iron. The popularising of steel dates from the great invention of Henry Bessemer, and the result of this invention may be judged of from the fact that whilst, previous to the announcement of his discovery at the meeting of the British Association for the Advancement of Science in 1856, the annual production of the kingdom was less than 50,000 tons, and the price from 50s. to 100s. per ton; the same quality of metal is at present produced at one-tenth the price, and the production is now counted by hundreds of thousands of tons. Nor is this all, for the probability of the still further cheapening of steel, and its still more extensive application, is great, considering the success which has attended recent experiments in the Cleveland district to utilise the enormous iron deposits which there exist—Messrs. Bolckow, Vaughan, and Co., although they have not yet reached the perfection they anticipate, have by the process of Messrs. Thomas and Gilchrist so far overcome the obstacles which existed that they are already taking orders for the manufacture of Cleveland steel, and making arrangements for its production upon a very large scale.

The successful development of the process will, it is confidently predicted, secure the inventor a rank among the greatest discoverers of the age, whilst its importance to the community at large has been accurately explained in the *Times* as being derived from the fact that hitherto only a very limited proportion of the ores of the United Kingdom have been available for steel making because of the presence of phosphorus. The elimination of that vitiating element will at once render applicable to this purpose all the ores in the country, or, in other words, will adapt for the metallurgy of the future the whole of the seventeen million tons raised annually in Great Britain instead of only an eighth part of that quantity. To the Cleveland district it promises a fresh lease of vigorous and active life. In that district the 2,000,000 tons of iron annually produced contain about 30,000 tons of phosphorus, worth for agricultural purposes as phosphoric acid above a quarter of a million sterling, while the money difference hitherto existing between hematite and Cleveland iron has not been short of four millions sterling, due chiefly to the presence of this 250,000 lbs. worth of phosphorus. The adaptation of the Cleveland ores for the manufacture of steel will not only remove this great difference, but will turn the scale against the hematites of the West Coast and all other expensive ores. Cleveland steel from Cleveland ore will, *ceteris paribus*, defy competition. It is not intended to imply that no other district will be able to carry on the steel trade. By reducing the cost of its hematites—which allow of a margin in this direction—the Barrow district, with its excellent ores and admirable shipping facilities, will probably continue, in any event, to keep a good place in the race. But the success of Cleveland means that Wales and Sheffield must largely, if not entirely, go to the wall in respect of the steel rail trade. The Welsh steel trade is now mainly dependent upon the importation of foreign ores. It is true that such ores have recently fallen very much in price—so much so, indeed, that Spanish ore has recently been offered at Cardiff at 11s. 10d. per ton. But there will, even with this access of cheapness, be a difference in favour of Cleveland-made steel of not less than 8s. to 10s. per ton. Any process that succeeds in eliminating the phosphorus from Cleveland ore will, of course, be equally applicable to other cheap ores, and it is not improbable that we may before long witness a development of the steel trade in Lin-

colnshire, Northamptonshire, and other districts where cheap ores are more or less abundant. Scotch ironmasters are looking forward hopefully to the new process as one likely to lead them out of the slough of despond in which they have been placed by the decay of the finished iron trade. There seems to be no good reason why Scotland should not become a formidable rival of Cleveland under the new order of things. No district, except South Staffordshire, is in such close proximity to supplies of raw material.

The position, both financially and otherwise, of the Iron and Steel Institute is stronger than at any time since its inauguration; the number of members has reached 1000, the treasurer has an available balance of nearly 7000l., and the retiring president—Dr. C. W. Siemens—has offered 10,000l. to the Council with a view that the society may be provided with a suitable meeting place, without being dependent upon the courtesy of others. The new president, Mr. Edward Williams, pointed out that our best blast furnace plant and appliances are not to be greatly improved, although the waste heat might be utilised more than it is. In Cleveland, where there is a great deposit of salt, brine might some day be evaporated on a large scale by the waste heat now being thrown away from boilers, hot blast stoves, and several kinds of furnaces. With regard to puddling the President observed that only very moderate advantage had accrued from the use of the various machines introduced to supersede hand puddling. For railmaking the puddling forge had disappeared, and it had been superseded almost entirely by the Bessemer pit, which in principle, general arrangement, and even details, remains as it came from the hands of its inventor, and seems scarcely to admit of improvement. Sir Joseph Whitworth's excellent compressed fluid steel was referred to, the President observing that, except for guns and armour plates, that material had not come largely into use. Touching upon the statistics of steel manufacture the President stated that whereas in 1869 the make of Bessemer ingots in this kingdom was barely 200,000 tons, last year it was over 800,000 tons, the American make being nearly as much, while on the Continent it was growing. Referring to the process of Messrs. Thomas and Gilchrist for the dephosphorisation of ordinary pig-iron by means of a basic lining, recently introduced at the works of Messrs. Bolckow, Vaughan, and Co., at Middlesbrough, the President observed that the idea was not a new one. It had been previously tried, but unsuccessfully. Messrs. Thomas and Gilchrist, however, had achieved a practical success by their method of dealing with the question, and it was believed that before long the cheap pig-iron of Cleveland would be extensively used for making steel. Touching upon the statement sometimes made to the effect that the manufacture of iron and steel in this country was losing ground, and that we were in fear of rivalry from our American and continental friends, the President observed that he did not see much ground for alarm, although to maintain a leading position we must by every means in our power add to and make general our knowledge of the composition and character of the materials dealt with.

With regard to the technical and scientific acquirements of those connected with the iron and coal trades Mr. Williams' remarks are worthy of careful consideration. He remarked that a higher technical education was gradually pervading the rank and file of our ironworkers, and its influence would make itself felt in the results of their labours. In the scientific training of overlookers and higher agents the President observed there was room for improvement. It was much to be desired that educated, intellectual young men who now hung listlessly about the professions and so-called genteel occupations, which promised to them only respectable poverty with the more than doubtful advantage of leisure, should break through the absurd old prejudice against seemingly rough work, and go over to the healthy business of iron and steel making, in which they might render the world good service, and obtain substantial remuneration by active employment of a very agreeable sort. Of the higher management of great works, he said in conclusion, he scarcely dared to speak, but as a rule it really is not as it should be, and he hopes to be forgiven for saying that there is need of amendment. For some unaccountable reason it seems to have become the opinion that gentlemen without special training, often engaged in other business of an entirely different sort, and coming only occasionally to the works as directors, can adequately and efficiently control and manage great manufactories. He is convinced that this is entirely fallacious, and that already there has been much hurt and loss by the system which in great part has obtained since manufacturing establishments became of unweildy size, and passed from the hands of those who had grown up with them, and understood every detail, into those of corporations and companies, unskilled in the necessary technical matters, without knowledge of the local circumstances, and wanting also the good personal relations which existed between their predecessors and the persons they employed. It is not easy to name a business more complicated and fuller of detail than the real management of a great iron and steel works, which to be efficient should have the constant attention of a competent staff, led and actually controlled by a technically trained manager, skilled in the special business, and possessing, if possible, the somewhat rare quality which Motley, the American historian, well describes as "a gift which no training and no culture can bestow, and which comes from above alone by birthright divine; that which men willingly call master—authority." It would be invidious, though not difficult, to show that where this kind of management has been the rule there is usually prosperity, and how many good and promising establishments have languished, and are languishing, for want of it. There is, he thinks, a great future for iron and steel, not only in the few branches of the manufacture he has referred to but in each and all of them; notably, he believes, in the employment of blown metal for castings that with no great additional cost cannot fail to be greatly superior in strength to any made from untreated pig-iron however good, and it will be strange if in the state of general education which is coming men like Cort and Rogers, Neilson and Vaughan, Bessemer and Siemens, Bell and Menelaus, and other able men at home and abroad, who have made the art of iron and steel making what it is, do not arise in greater number to lead, improve, and strengthen it. That the workmen of our free country will be unequal to their duty, or fail in it, he does not believe; on the contrary, he hopes and expects that with better education, and the great improvements it must bring, they will hold in the future, as they have held in the past, the foremost place for skill, endurance, and honest industry.

The address was warmly applauded, and the vote of thanks to Mr. Williams for the information given and suggestions made was moved by Earl Granville, seconded by Lord Frederick Cavendish, and carried unanimously. The President, in presenting the Bessemer Gold Medal for 1879, which had been awarded to Mr. Peter Cooper, of New York, "the father of the American Iron Trade," remarked that Mr. Cooper had been connected with the iron trade of America for 50 years. In 1830 he built at Baltimore the first rolling mill, and he subsequently constructed the first locomotive in the United States. He had founded the Cooper Institute for technical instruction, and had in many other ways materially advanced the iron and steel interests in America. Mr. J. Lowthian Bell, M.P., received the medal on behalf of Mr. Cooper, who, he stated, was only prevented by age—he being 90 years old—from undertaking a journey across the Atlantic to receive it in person.

The papers "On the Mechanical Properties of Iron and Mild Steel," by Mr. Daniel Adamson; "On the Use of Iron and Steel in Combination in the Construction of Bridges," by Mr. H. N. Maynard; and "On the Use of Steel in Naval Construction," by Mr. N. Barnaby, C.B., were discussed simultaneously. In the course of the observations it was stated by Mr. Bessemer that he produced mild steel 20 years ago, samples of which were placed before the meeting. Mr. Bessemer also observed that Mr. Barnaby's list of steel-built ships was a very limited one, and he read a lengthy list of steel-built vessels which he had obtained through Lloyd's. Mr. Denny, of Dumbarton, stated that at the present time there were nine ships being built of steel in his yard, and he had nothing but steel on his works, having the fullest confidence in that material. An observation fell from Mr. Dixon to the effect that if the price of steel were brought somewhat nearer to that of iron it would be very largely used in shipbuilding, provided the quality was not lowered. Mr. Martell observed that at Chatham the steel was not fairly used, and

* Being Notes on a Course of Lectures on Mining, delivered by Herr Berggrath Dr. von Gronow, Director of the Royal Bergakademie, Clausthal, The Harz, North Germany.

hence the failures in some of the angle bars complained of by Mr. Barnaby. It was, moreover, stated that the details of manufacture greatly influenced ultimate results, and that the mysterious behaviour of the steel angle bars might be due to some slight circumstance connected with its production. It was observed, with regard to the composite bridge designed by Mr. Maynard, that when steel and iron are used in conjunction and contact a corrosive action is set up, so that structures should be either all iron or steel. The next three papers—on Thomas and Gilchrist's, G. J. Snelus's, and H. Riley's processes for using basic linings instead of the usual gas-liner linings in furnaces and converters—were also taken together. Mr. Snelus, in 1872, patented the use of basic linings for furnaces and Bessemer converters, and he carried out a series of experiments which proved the correctness of his views on this head. Having, however, the management of large works, the interests of which were opposed to the solution of the problem in question, Mr. Snelus was obliged then to abandon the prosecution of his views in this respect. Papers were also read on a volumetric method of determining manganese in manganiferous iron ores, by Mr. John Pattinson, and on the chemistry of puddling, by Mr. H. Louis. In connection with Dr. Siemens' munificent offer, it was remarked that the Government had intimated that they would in time require the house of the Institution of Civil Engineers, and as there were several other societies representing the applied sciences which were in a similar position to the Iron and Steel Institute, it was proposed that some united course of action should be taken. The usual votes of thanks were then unanimously carried, and the meeting was then formally adjourned until the autumn.

Original Correspondence.

THE METALLURGICAL TREATMENT OF OXIDISABLE MINERALS.

SIR,—I enclose copy of a letter from Mr. Joseph Roskell, of Swansea, who is well known to many of your readers, and I trust, therefore, you will decide to include his letter in your next issue.

London, May 13.

JOHN HOLLWAY.

SIR,—I regret my inability to be present at the discussion* tomorrow evening for reasons already known to you; but thinking you might like to hear what my views are of your process, I take the only course left me—that is, submitting them to you in writing.

I am sorry that I was not present at the last two experiments which you have carried out, as I might then have been better able to speak of your process on all the points which you have so far proved; still I have had the great pleasure of witnessing sufficient to enable anyone to form an opinion on the practicability or otherwise of your invention. In the experiments hitherto carried out by you successfully so far as regards proving what you intended them to prove, you have only used the poor cupreous pyrites so abundant in Spain and other places, and you have proved the applicability of your process for the treatment of such like poor ores advantageously. You have, however, not yet proved the applicability of your process for the treatment of such ores that are used generally by copper smelters.

There are many varieties of ores in the market that would suit your process admirably besides those that I have named to you in previous letters, and until you carry out an experiment, using mainly some of these ores either with or without the Spanish pyrites, it will not be believed in some quarters that your process is applicable for the treatment of this class of ores. I myself feel assured from what I have seen that it is applicable to all such ores that are used by copper smelters, which contain an appreciable amount of sulphur, and if you had used some of these ores in your trials your success would have been much greater than it is, so far as your results are concerned. Besides this, I think an experiment with such ores will be the only way in which the copper smelters can be convinced of the value of your invention, and get them to take it into consideration.

I think that it is principally in the vicinity of mines that your process will become generally useful. You are aware that the ores sent into the markets are chiefly crushed, and perhaps this fineness would be a drawback, as the ore would be so closely packed in the cupola that it might be difficult for the gases to escape through. If your process was, however, adopted in connection with the mines, this crushing could be avoided, and the ore left in rough pieces, which would not be too closely packed to resist the passage of gases, &c., and again, the ore would not need to be dressed as it is done at present to bring it to as high a produce as they possibly can.

You know that copper smelters get a slag of a lower specific gravity by smelting these various classes of ores than you have hitherto obtained without having recourse to any silicious material to reduce the specific gravity other than what is contained in the different classes of ores used, and I do not see why you could not get quite as good, if not better, results, for you certainly get a much more liquid slag, so that any "shots" or "prills" of regulus that might be disseminated through the slag would have a much better chance to separate, and providing you do not work up your regulus higher than about 30 per cent. or so, as mentioned in letter of March 6, I see no reason whatever why you should not get a cleaner slag than we could ever think to get.

In using these ores you would not have anything like the same amount of iron to contend with as you have by using only the Spanish pyrites, and this would be beneficial to you in several ways. Your linings of the cupolas would not be so violently attacked as they are at present unless an excess of silicious material is used to counteract its destructiveness, and this would also tend to reduce the specific gravity of your slag; besides this you would have 8 to 10 times as much copper as you have now, and this would certainly cause you to lose a less quantity of copper in your slags, and would also greatly curtail the cost per ton of regulus produced.

There are some other classes of ores that are used by copper smelters, but which your process would scarcely be applicable for; I mean the carbonates, oxides, &c., for reasons already mentioned in my former letter. These ores form by far a very small proportion of the ores used by the smelters, and if you were using very poor pyrites, but rich in sulphur and iron, it would be quite possible to use a small quantity of them.

Another method by which these classes of ores could be made applicable to your process would be to smelt them with the coarse regulus obtained from the poor sulphides, and also with the rich sulphides of copper. In this manner you would be able to bring your regulus up to 50 per cent. or so. The slags would, however, contain too much copper to be thrown away, but they might be mixed with the poor ores in the first instance, and thus recover the copper. I do not see why these slags would not melt quite as well as sandstone, if not better. If the slags could be used in this manner then your process might by careful and judicious management be made applicable to nearly if not quite all classes of ores. If you can recover such an amount of sulphur in the free state as would cover the cost of the sulphur paid for in the pyrites, I can quite conceive the desirability of purchasing Spanish pyrites so as to ensure having a regulus not too rich in copper, and thus enable you to use up ores that would be otherwise unsuitable.

Taking all things, however, into consideration, my opinion is that unless you think to turn copper smelter altogether, and work up your regulus into copper, it would be very much better not to attempt to use any other than the poor sulphides containing (say) up to 15 or 20 per cent., and leave all richer sulphides, unless you have plenty of poor ores to mix with them as well as the carbonates, oxides, &c., to be treated as they are at present in reverberatory furnaces.

Chemical equations showing certain reactions are not always to be relied upon in treating practically certain compounds of copper for several reasons—the mixture cannot be made exactly intimate, the heat may vary at different times and so cause a difference, and again the materials have not always exactly the same composition. What I mean is this—if oxide of copper is mixed with sub sulphide in the proportion calculated according to the equation $\text{Cu}_2\text{S} + \text{CuO} = 4\text{Cu} + \text{S}_2$, we should be led to expect four equivalents of

copper. Sulphur dioxide being given off but really, you do not obtain this result even when using pure materials; much more then would be the difference when heated practically with an oxide ore (say) and a sub sulphide such as our white metal; therefore, I think it would be advisable to leave out of the question the treatment of these several classes of ores, and as I have said before, limit yourself to the use of the poorer class of sulphides solely.

With these few remarks I must close, wishing you a successful meeting.—Swansea, April 29.

JOSEPH ROSKELL.

OUR CANADIAN LETTER.

SIR,—Probably there is nothing that surprises one who is acquainted with the people of the United States and the people of Canada more than the ignorance which each people displays concerning the other. In Canada many Canadians judge the people of the States by the border population, or, further back in the country, estimate them from the knowledge they have of the house traders and patent medicine men who come amongst us. Think of Boston and Boston men being thus estimated! In the States many of the people think we are in a state of semi-slavery, that our laws are made by England, that our taxes go to England, and that we have no liberty. I remember going into Cincinnati, and talking with a man who seemed intelligent enough with regard to his own country, but would persist in telling me that we were under "petticoat government," that all our taxes went to England, and that, compared with the American Union, we had no liberty whatever. How difficult it was to explain our system of responsible government you may easily imagine, nor could it be accomplished, for he was like the General in "Martin Chuzzlewit," who obstinately maintained that the Queen lived in the Tower of London.

The intercourse between the countries is getting so great, however, that the ignorance will soon be dispelled from the people on both sides of the line. That intercourse might have become much closer had the Reciprocity Treaty continued. It was not the fault of the Canadians that it did not continue. Since it is gone, we can only help ourselves, and the people have taken a manly stand to do so.

The abrogation of the treaty debarred our produce from the American market. During the war and a few years afterwards the prices of things were so high in the States that we did not feel the effect. But in 1873, when prices fell in the States, our markets lay open to the manufacturers of the United States, and from 1873 to the present time we have been suffering. We were in the position of a small landowner of 10 acres lying beside a large landowner of 10,000 acres. The large landowner had a fence round his land as high as a very high tariff could make it, while the small 10-acre chap had no fence to signify. The consequence was that the cattle of the large landowner fed on the 10-acre lot, while the cattle of the small landowner could not go into the 10,000 acre pasture. Such was the state of affairs till Sept. 17, 1878, when the Canadian people by an overwhelming majority defeated the McKenzie Government, and put Sir John A. McDonald into power, committed to a protective—or, as it is styled, "national"—policy. As soon as possible the Finance Minister—Hon. Mr. Tilly—began to take steps to recover our former prosperity. He found his predecessors had left the country in a rather poor plight, that there was a deficit of \$2,000,000, and that it would require careful management and astute statesmanship to bring our resources and the country back to the condition they were in when Messrs. McKenzie and Co. took power in 1873. His first step was to go to England and obtain a loan of 3,000,000; the next was to bring in the tariff. Our little pasture was nearly eaten up, and we must raise a wall as well as our great neighbours.

A few of the items in the tariff may be of interest to your readers. Books—printed, periodical, or pamphlet—not being foreign reprints of British copyright works, 6 cents per lb.; British copyright works, 6 cents per lb. and 12½ per cent. ad valorem; books, periodicals, or pamphlets imported by post, for every 2 ozs. in weight or fraction thereof 12½ per cent. ad valorem; blank books, 25 per cent. ad valorem; printed, lithographed, plate billheads, &c., cheques, &c., ad valorem 30 per cent.; advertising pamphlets, \$1 per 100; maps and charts, 20 per cent. ad valorem; printed music, 6 cents per lb.; playing cards, 30 per cent. ad valorem; agricultural implements, 25 per cent. ad valorem; artificial flowers, 30 per cent. ad valorem; cement, Portland or Roman, 20 per cent. ad valorem; manufactures of cotton—on grey or unbleached cottons, Canton flannels, &c., 1 cent per square yard and 15 per cent. ad valorem; on all cottons, jeans, twillings, bed ticking, &c., 2 cents per square yard and 15 per cent. ad valorem; on all cotton wadding, batting, batts, and warps, 2 cents per lb. and 15 per cent. ad valorem; if bleached 3 cents per lb. and 15 per cent. ad valorem; on cotton warps on beams, 1 cent per yard and 15 per cent. ad valorem; on cotton seamless bags, 2 cents per lb. and 15 per cent. ad valorem; on cotton shirts and drawers, 30 per cent. ad valorem; on cotton sewing thread, 20 per cent. ad valorem; on all clothing made of cotton or of which cotton is the component part, including corsets, 30 per cent. ad valorem; on all manufactures of cotton not elsewhere specified, 20 per cent. ad valorem.

I think in the last article the estimate must have had a hidden meaning, for there was an old gentleman in Ottawa, who used to be editor of the Times newspaper, whose name was Cotton, who is said to have declared he would like to see any government change faster than he could, alluding to the fact no doubt that when the McKenzie Government came into power he changed from a supporter of one government to the supporter of its opposite. However, we have got through with all the cotton articles of every description. There is a considerable duty on fruit. On giant powder and dynamite, &c., 5 cents per lb. and 20 per cent. ad valorem; india-rubber, boots and shoes, and other manufactures, 25 per cent. ad valorem. It is to be hoped the Canadian Rubber Company of Montreal will see their way to make some goods which will wear a little while, or that some other manufactory will start in Canada, for the shoes they have been turning out, or allowed to be sold with their name, are simply absurd. I bought a pair, and they lasted three weeks only. Pig-iron is \$2 per ton. There is a good chance for some of the iron furnaces to move over here. We have only one in Canada, and that is at Three Rivers. On lead in pigs, 10 per cent. ad valorem. This is for the purpose of having our lead mines developed, and there are a great many good mines.

But your readers must be tired of the tariff by this time, and I shall turn to a free and open field, not so cramped as duties—the Great North-West. What Illinois and the States of the West were 40 or 50 years ago, or may be less, such to-day is Manitoba and the North-West. It is a magnificent country, abounding with all the requisites for a farmer, and capable of supporting an immense population. People who have taken up land in Manitoba speak of it in the highest terms. This country is now open by the Government, and any male or female being the head of a family may take up 160 acres of land, pay \$10 Government fee, and live on it for three years, when they will get a patent from the Crown, and own the land absolutely. What a chance for the women. Here is a magnificent opportunity of testing the woman's right theory. Any woman may take up the land as well as any man. A thousand of these advocates for women's rights might bind themselves together, form themselves into an association, take up the land, and live in peace and quietness, far removed from "those horrid men." In Canada they prefer to unite resources, and generally go in couples, or the man goes first and takes up the land and gets settled, then sends for his sweetheart. She goes up to Winnipeg, meets her intended, goes to the Government land office, takes up her 160 acres, and then they go to a church, get married, travel home to their land, and live in peace and happiness. But then we are old fashioned, and not imbued with woman's rights theories. Crops on the Little Saskatchewan last year were as follows:—Wheat, 40 bushels per acre; oats, 75 bushels; barley, 65 bushels; and peas, 50 bushels per acre. It is unsurpassed as an agricultural district. The climate is very healthy. The city of Winnipeg is about six years old, and has now a population of about 6000. It is increasing fast, and the fact that it now has railway communication causes a great increase to the population. A firm named Prittie and Young, Land Office, Culbourn-street, Toronto, have made arrangements with the different railways, and send off parties twice a month on the Cook, Son, and Jenkins' principle. They have their own cars, and send a messenger from Toronto to Winnipeg to take charge of the passengers, charging for the whole fare only \$25. From Boston to Toronto I suppose it would be \$20,

so for at least \$50 people are landed in Winnipeg from the State of Massachusetts. There is hardly any doubt the country will be settled quickly, and those who get there first will secure the pick of the land.—May 1.

BOURNONITE.

MINING IN NEW SOUTH WALES.

SIR,—GOLD MINING has taken a spurt lately in reefing, owing to the Berrington fields, where there have been several crushings of hundreds of tons, giving from 2 up to 6 ozs. per ton, and as the district extends a considerable distance, and is a perfect network of reefs, it bids fair for a highly prosperous future.

PYRITES, for the first time in our history, is at last getting a fair trial under the able management of Mr. Masters at the Forest, near Carcoar, where, owing to the liberal enterprise of Messrs. Newton Brothers, a large lode has been lately opened up (said to give 1 oz. of gold per ton), and over 10,000Z. expended in proper appliances and works, so that the greatest result can be obtained by the least outlay of labour. There has only been a trial crushing as yet, but it is so far highly satisfactory; and now that Mr. Masters has shown practically that his process will extract the precious metal from the hitherto impracticable mundaic, and leaves a large profit, it will lead to the working of many other deposits and lodes known to exist and to be rich (by analysis), but which have hitherto defied the unskilful treatment of unscientific managers (?), still further crippled by the want of proper plant and sufficient capital assured at the outset. Some twenty years since a lode about 3 ft. thick was opened up at Mounja, some hundreds of tons ore raised, and about 30 tons sent home to London; it assayed on an average about 3 per cent. of lead, and 10 ozs. silver and 1½ oz. gold per ton; but the price realised barely covered the cost of raising and shipment home, &c., and as the little free gold in it would not pay for crushing on the spot it has lain idle ever since. It is an arsenical pyrites, and with the above amounts of gold and silver in it ought to pay splendidly with the processes lately discovered, as there is the original machinery (20-head stamps) and works all in fair order, and a roasting furnace and vats are all that need be added for a trial. As the ore is a peculiar one I send you a sample (by a gentleman now returning to England), as it may interest some of your more scientific friends.

KEROSENE SHALE.—We have just made a direct shipment from Sydney to Liverpool of 950 tons for the gasworks! This is expected to be only the beginning of a large and continuous export to the Mother Country, as the quality of our shale is A 1, and the Government here have made the railway rates specially easy, so as to foster the export of it.

IRON.—We are about calling for tenders for 1000 miles of new railways, also for waterworks—with about 40 miles of iron piping—and other works where iron is wanted, and as freights on dead-weight from England are now doubled there is really a splendid chance for capitalists to work our Wallerawang iron and coal deposits—said by geologists and practical iron-workers to be one of the largest and richest in varied and rich ores in the world, and a Government bonus of 10,000Z. offered for the first thousand tons of rails made there.—Sydney, N.S.W., March.

R. D. ADAMS.

NEW MEXICO.

A RECEIVERSHIP ORGANISED BY COURT FOR THE MAXWELL LAND GRANT AND RAILWAY COMPANY MORE COSTLY THAN THE TERRITORIAL GOVERNMENT—NEW DISCOVERIES.

"The principal business of importance before the Circuit Court at Cimarron Colfax County, during its recent session was in relation to the Maxwell Land Grant. But it was postponed until the second week, in order to allow Judge Birdseye, of New York, who represents the Dutch bondholders, to be present. The receiver, Mr. Thornton, presented his report, and after a long conference of counsel on various points Chief Justice Prince made a number of important decisions on the subject. Among the matters included in them were the following:—Two townships were allowed to be sold, one at the Vermejo and one at the Cimarron at the railroad crossing, each to be 320 acres in extent; 30 acres to be donated to the railroad for a depot at each point. The leases, loans, and actions generally of the receiver were confirmed. By consent of all parties the receiver's salary was fixed at \$5000 a year, and he was empowered to find an assistant at \$1000 per month. By consent \$1000 each was given to Breeden and Waldo and T. B. Catron, as receiver's counsel. In order to obtain a sale as soon as possible, and so open up the grant to settlers, all the suits were consolidated, and the referee to take testimony was to report by Aug. 1. The receiver was authorised to sell the right of way to the railroad, and to supply it with ties, &c., at fixed prices. None of the suits brought by the receiver against occupants were tried."

SIR,—Thus runs the official summary of proceedings. Thornton is the partner of T. B. Catron, as a law firm. Thus they receive \$6000 per annum, the total expense of receivership being \$200, or double of the salary of the governor and secretary of the territory together.

At some previous period I reported in your esteemed Journal on the occurrence of argentiferous sulphides and carbonates of lead in the Cerrillos Mountains, situate south-west of Santa Fe. Of late these mines have attracted considerable attention, and a real excitement is prevailing in the north with regard thereto, though nothing more has been discovered than what was known to exist for years past, and nothing has appeared to modify the opinion expressed at the time by your correspondent "that the mines are not sufficiently developed to guarantee a regular supply of ore to keep the reduction works in uninterrupted employ." Though the same may be said with regard to the recent discoveries in the Sandia Mountains, being south-west of the Cerrillos, and directly bordering the Rio Grande, there is an essential difference between the two districts. In the Cerrillos the veins occur as fissure veins of small extent longitudinally and of narrow width, with but very scantily spread surface indications in granite, and the assays in the large majority show from 10 to 40 ozs. of silver to the ton of ore and no gold. In the Sandia Mountains the ore bodies are fissure veins, either on contact between granite and limestone or between some eruptive rock and the thereby disturbed strata. These fissure veins not only show a large body in length and width on the surface, but also a more or less uniform structure with regard to metallic impregnation, thus not only giving evidence of regularity in formation but also of regularity of product. The assays show in silver and gold a nearly equal value, and the base metals copper or lead, and these either as sulphides or as oxygenated minerals, the total assay in fine metal varying between \$50 and \$100 on the average per ton. As all labour and materials are cheaper in this territory than elsewhere on this continent, as the climate permits uninterrupted operations during the entire year, as stone, coal, and water are in immediate vicinity of these mines, they have within one month after their discovery attracted the attention of the substantial men of the territory, though not of the multitude of prospectors as the Cerrillos Mines have. The Sandia Mines are not exclusively of the fashionable carbonate kind, and no poor man's diggings, but require capital to work them, but with this they promise well, and indeed better than any I have seen previously on my long travels over this continent. If proper precaution is taken a good title may be acquired to a set of continuous claims. As a good feature it may also be mentioned that the miners of the district make good use of the power invested in them by law in making provisions for the better securing of title in mining property, as may be seen by the following, taken from the local paper:—

MINERS MEETING FOR THE SANDIA MOUNTAINS MINING DISTRICT.

All those interested in the discovery, location, and claiming of mineral veins or lodes within the limits of the Sandia Mountains, comprising all of Bernalillo county east of the Rio Grande and territory of New Mexico, are hereby informed that a mining district, as described above, has been organized. Also that the following officials have been elected to hold office until replaced by election by a meeting of miners held this day at the residence of Col. Francisco Peres, at Bernalillo:—Mariano S. Otero, chairman of meeting (the present delegate for New Mexico to Congress); Francisco Peres, marshal; F. M. F. Cazin, claim surveyor; Nathan Bibo, secretary. By said meeting also the following resolutions have been unanimously adopted:—The miners of Sandia Mountains mining district here assembled do resolve and proclaim:—

- 1.—In this district the provisions of the United States Revised Statutes, chap. vi. T. 32, and those of the territorial law of 1876 regulating the location of mining claims, shall not be further modified nor restricted beyond Article 2 to 4 of these presents, but remain valid to their full extent for the mining district by us organized and called Sandia Mountains Mining District.
- 2.—In accordance with Section 2334 of the Revised Statutes of the United States claims shall be void whether recorded or not, unless the location be described with regard to natural objects or really permanent monuments, or to previously recorded, well described, and valid claims in such a distinct manner as to exclude the applicability of such description to more than one location. Claims the location of which is described by the name of the hill on which or the water-course near which they are situated, in addition to the geographical position thereof, shall be valid, and otherwise shall be void.
- 3.—Claims shall be void in the Sandia Mountains mining district unless actually

* Referring to the discussion at the Society of Arts—a report of which appeared in last week's Journal.

recorded in the public records of the county of Bernalillo, territory of New Mexico, by the official county recorder or his deputy within 100 days after date of location. Priority of record shall be prima facie evidence for priority of location filing and claim, and conflicting claims shall have no other remedy but testimonial proof by two witnesses for the part of priority of location and of filing. No testimony shall be admissible in the case unless the witness be able to read and understand the claim in the language it was written in, and unless one of the witnesses for the priority of filing be the official recorder or his deputy.

6.—Resolutions passed by miners' meeting for the regulation of their rights in the Santa Mountain mining district shall not be binding, and shall be void unless hereafter the meeting passing such resolutions has been advertised in three weekly issues of all the newspapers of Bernalillo county above the names of at least three claim owners within the district, and unless previous notice in writing is given to the marshal of the district, and unless such meeting be held at the county seat *de facto* of Bernalillo county, and unless the votes of owners of recorded claims or of interests therein are counted.

So resolved April 8, 1879, whereunto I have affixed my signature,

Filed and recorded this 5th day of April, A.D. 1879, at my office, MELCHIOR WERNER, County Clerk and Recorder, by FRANCISCO PEREA, Deputy.

By these provisions it is evident that it is the intention to obviate the possibility of vexatious conflict of claims, or to express correctly, to obviate the sharp practice of blackmailing and jumping. The mines are within an hour's drive of the beautiful fruit growing town of Bernalillo, facing the Rio Grande Valley, a circumstance which brings about the rare possibility of really agreeable surroundings for the operators of the mines. As yet it appears that substantial development will remain on the hands of the inhabitants of the town of Bernalillo, and prices, therefore, range low as yet.

Copperfield, N.M., April 22. F. M. F. CAZIN, Mining and Civil Engineer.

NEW ZEALAND KAPANGA.

SIR.—As a holder of 50 shares I was somewhat astonished at receiving a circular emanating from the directors stating that more money was required, and that at the present time about 2500*l.* was unissued of the preference shares, carrying 20 per cent. interest, and 4500*l.* of unissued debentures carrying 10 per cent. Would it not have been better to have made an allotment *pro rata* to each shareholder according to his or her holding, and have stated frankly what the report of Capt. Thomas was—or published it in the *Mining Journal*—instead of asking the shareholders to call at the office and peruse it? As it is, if I or any other shareholder applied and took a proportion allotted or not, the result might be in case of liquidation that money would be thrown away, if sufficient funds in the aggregate were not subscribed. That the mine is a valuable one is beyond controversy; the simple question now is, will the shareholders possessing a property equipped with machinery of the best and most powerful kind, costing upwards of 40,000*l.*, with minerals existing of the richest description, allow other persons to reap the benefit of their outlay? The capital is in 20,000 shares of 5*l.* each, and have passed hands at 8*l.*, but are now selling at about 10*l.* upon the eve of success if funds are forthcoming. Surely each shareholder would subscribe 5*l.* per share, or even 10*l.*, in order to save the property. Moreover, he or she is entitled in one instance to 20 per cent., and in another to 10 per cent. interest in preference or debenture shares. What are the directors doing in the matter? Are they subscribing liberally? I am willing to subscribe my proportion if others will do the same, and in the event of there not being enough money forthcoming to warrant the directors in making an allotment will my money be returned? Surely the directors should make a clear and succinct statement, either by calling a meeting and stating what is required to meet the wants of the mine, its present position financially or otherwise, and what proportion of shares they take, what proportion is subscribed for, and if not enough ask each shareholder present at the meeting if they would assist and get their friends to aid in overcoming the difficulty, and thus establishing the property. I see no practical distrust or want of confidence. The mine is there, rich beyond doubt; everything is provided in the way of machinery; but a paltry sum of 3000*l.* out of a capital of 100,000*l.* hinders its development. Let each shareholder subscribe 5*l.* per share—5000*l.*—or, if a *pro rata* allotment is made, contribute a twentieth in the way of preference shares, and if it cannot be done, get their friends to assist, and save the principal.

The mine is a gold one—not tin, copper, or lead—if it had been other than gold I should have questioned its success as the price of those metals now stand. Let each shareholder contribute his mite, and the directors plainly set forth their scheme at a general meeting, and see if the company now established cannot prove that all concerned in its welfare have but one common interest.

SHAREHOLDER.

OPPRESSION OF LANDED PROPERTY BY THE OVERT ILLEGAL CONDUCT OF RAILWAY COMPANIES.

SIR.—Now that the Premier has, *proprio motu*, abandoned the last landmark or foot-prints of Protection—hope of its modified restoration—it may not be deemed an inopportune moment to shadow forth the urgent necessity for forming a Landowners' League, to enforce an equitable execution of the law, to which even the most humble subject in the realm is entitled. Parliament in granting railway concessions has enacted certain laws, one of which, the Traffic Act, 17 and 18 Vict. c. 31, stipulates that "No railway company shall give any undue preference or advantage to or in favour of any particular person or description of traffic in any respect whatever." The very highest continental authority, the eminent Secretary of the Central Commission of French Railways, in his third volume, "Du Regime des Travaux Publics en Angleterre," pages 113, 114, gives a succinct rendering of the Act, "Les tarifs doivent être également perçus d'après le même taux que ce soit par tonne et par mille, ou autrement, et pour tout le monde voyageurs et marchandises."

At the maximum rate of 1*d.* per mile for a third or lowest class passenger, a ton at the accepted computation of 15 passengers is charged at the rate of 1*s.* 3*d.* per mile, whilst to enable the Great Northern Railway Company to compete with seaborne coal transit, notwithstanding their General Manager's evidence—Great Northern and Great Eastern 1878 parliamentary campaign—that "such is impracticable," the Great Northern convey coal at 36*d.* per ton per mile under 4*d.* a ton per mile, which was lowered in 1871 to a fraction above 4*d.* a ton per mile, at which rate, according to the Times City Article, the Great Northern and the Midland were working at a loss of 300,000*l.* a year. Fraser's Magazine of October, 1877, on "The Progress of some of our Railways towards Bankruptcy," shows the appalling condition of such management.

Landowners' rent rolls have been subjected to serious rebate by reason, thanks to modern idiosyncrasy, of so-called free trade, forsooth, when States which, in lieu of reciprocating, levy prohibitory duties on our manufactures, culminating in one great cause of the prevailing stagnation of industry and commerce in this kingdom. Without enumerating the various countries entering into this category, which would necessarily launch me into unpardonable prolixity, it may suffice to name Russia, which, depending chiefly on this country for the disposal of her cereals, timber, flax, &c., imposes insensate fiscal restrictions on our staple exports. Land is offered in the most fertile zone of Russia—Podolia, Ukraine, Poltowa, Kourak, and Chernigow—at 25 roubles the dessiatine, or 26*s.* the English acre, without finding buyers; descending, in the steppes of the Crimea, to 75 copecks, or 9*d.* an acre; the average freight of Russian grain to this country in 1878 being under 4*s.* a quarter. With the improvement of her vast water-courses, and consequent greatly reduced cost of transport, the landowner in this country will be placed in a still worse position, which already is reacting so severely on the agricultural labouring population. Is it possible to realise the fact of still greater disaster befalling the landowner and his dependants through the illegal conduct of the Great Northern Railway Company as set forth? The tocsin has sounded, and the law must be respected and carried out in its integrity. Our legislators have enacted just laws affecting the exploitation of railroads, by prohibiting any preference to be given to any particular element of traffic, than which nothing can be more distinct and set forth with greater perspicuity in the Traffic Act quoted. But let us contemplate the application of the law. Mineral property in the vicinity of a railroad having access to the Metropolis, as the Great Northern Railway is *ipso facto*, as the law is now contravened, greatly enhanced in

ephemeral or transitory value. Competition with seaborne traffic has reduced the Great Northern coal rate to less than 4*d.* per ton per mile to the Metropolis, entailing a heavy loss on the shareholders who, along with their Midland fellow-sufferers, have already been victimised, according to the Times, to the terrific loss at the rate of 300,000*l.* a year in 1871 in this identical coal traffic. Fraser's Magazine for November, 1878, states—"The railways of the United Kingdom have, as commercial undertakings, concealed their items of expenditure." We know how sensitive the Stock Exchange barometer is. The Railway Times of Oct. 19 states—"Accusations of paying dividends out of capital have been made against the Great Northern." The Times observing—"The necessity of a radical change of the system of audit is imperative." An immense undue advantage accrues to the landholder simultaneously owner of mineral property over the ordinary landholder hereof of the benefit of any such geological boon, and restricted to the surface of the soil, who in lieu of less than 4*d.* per ton per mile transit cost is mulcted with 1*s.* 3*d.*, or fortyfold more than his neighbour. Were the same measure of justice meted out to the surface landowner we should witness an immense increase in the value of land for the cultivation of agricultural produce, and for building sites—the greatest conceivable benefit conferred on the working classes. The building trade would be raised from its prostrate state. The question is too serious to brook delay, and the mandate of public opinion, under the aegis of the inviolability of the law, will be supreme. Towering spirits have fallen, and railway magnates will not have occasion to reiterate the words of a crest-fallen octogenarian diplomatic celebrity—"Nous avons soufflé sur ce nuage, qui obscurcissait notre grandeur, et il s'est évanoui." I have had the privilege of ventilating my steps at the Board of Trade and at the Railway Commissioners' department, and I have not met with anyone dissenting from or controverting the views I have enunciated.

I have been urged to bring my case—as purchaser of land contiguous to the Great Northern Railway for building sites—before the Railway Commissioners in the aforesaid sense, upon which they possess power by statute to deal with the tolls as they may think fit, but I deem it of the utmost importance that the question should be taken up by the powerful landowners in such manner as may be most conducive to success under their aegis and organisation, who will have the strenuous support of the working classes, shipping and industrial interests, and the public generally.

20, Little Tower-street, May 14. WM. JOSEPH THOMPSON.

SUPPLY OF WELSH STEAM COAL TO LONDON.

SIR.—Permit me to crave reference to my letter, thus headed, in the Journal of Oct. 26 last, setting forth the importance, in the depressed state of shipping, that an alleviation be sought for in a reduction of the cost, and in an immunity from breakage of friable or tender smokeless steam coal. Desirous of eschewing prolixity by a recapitulation of said correspondence, I beg to state that after submitting my system to the highest technical authorities connected with steam shipping via Suez and the Cape, I am in a position to prove to the satisfaction of the proprietaries by the adoption of my system of transport—in no manner differing from existing screw-colliers, except having end-to-end hatches, rendering practical the appliance of a greater number of direct-action cranes and a much larger number of hands to load and discharge; further, canal, sea, and fluvial transport direct from the pits to along-side the steamers in the London Docks, as precited—a practical saving, after defraying all working expenses of whatever nature, and the distribution of a dividend of 10 per cent. per annum, a net saving of more than the present amount paid for the best smokeless Welsh steam coal, transport, lighterage, shipping, and trimming on board steamers in the Docks. By the formation of a syndicate of the leading steamshipowners, the most deeply interested in the proposed undertaking, with their co-operation and under their aegis exuberance of capital is assured for displacing the transit by rail, and rescuing the extremely tender Welsh smokeless steam coal from breakage, hundreds of tons having, through trituration in a lengthened rail conveyance in open tracks exposed to the weather, breakage at Chelsea basin, and loading in the Docks, been thrown overboard, and otherwise rejected as unfit for use.

WM. JOSEPH THOMPSON.

20, Little Tower-street, May 14.

COLONEL SHAKESPEAR ON SAFETY-LAMPS.

SIR.—It affords me great pleasure to send you my challenge, which is expressed in general but, I hope, in sufficiently accurate terms.

My lamp shall be at least five times safer than either the Davy, Clanny, Stephenson, Mueseler, or Protector now in use.—The price shall not be in excess of the most expensive, nor shall the working cost be more.—The weight shall be considerably less, and the light not inferior to that of the Protector.—It can be held 45° or 50° out of the perpendicular and still remain alight.—When once closed it cannot be opened and remain alight.—Two or more can be taken to pieces, cleaned, lit, and put together again in the time spent over one of Mr. Teale's Protector lamps.—The oil is not an explosive liquid like the so-called colzoline, dangerous to property.—By a contrivance so simple that it costs nothing my lamps can be at any time rendered as sensitive to fire-damp as the Davy, or as insensitive as the Clanny.

In conclusion, I claim that "blowing through" cannot occur. I, therefore, claim more, and say mine is an entirely safe safety-lamp. Let anyone come to the front and produce another equally good or superior. I mean, of course, a safety-lamp adapted to use.

A few only of these lamps are made, as I have but little time for work of the kind, and none have been given out to lamp makers. No doubt Mr. Teale is game for another contest with me, and I shall be well pleased by his availing himself of the opportunity which I now gladly offer him.

J. D. SHAKESPEAR.

Baron's Court, Fulham, May 14. F.G.S., Assoc. Inst. C.E.

P.S.—Mr. Teale's statement that my lamp is a failure is a wanton and deliberate outrage, for he most certainly knows less of it than he does of the moon.

NEW EXPLOSIVE FOR MINES.

SIR.—I always understood it to be a fundamental principle of the English patent law that no patent should be granted which includes a whole range of generalities, yet from the recent decision of the House of Lords it appears none but the one plaintiff company can use nitroglycerine absorbed by a non-explosive material as an explosive. Now under these circumstances I should like to know whether this obstructive judgment will affect the invention of Messrs. Trehearne and Jones, of Cardiff and Caerphilly, which has the very important object of making an explosive which instead of being fearfully dangerous like dynamite is absolutely safe. The object of their invention is so to prepare nitroglycerine as to remove the liability of its exploding while being handled or prepared for use. Various processes have already been proposed for attaining this end, and that with varying advantages, and at greater or less cost. They now propose to provide an inexpensive absorbent for the nitroglycerine, and one which will answer efficiently in removing its liability to explode prematurely. In carrying out the invention they first prepare the nitroglycerine in the ordinary manner, and then add thereto magnesia (by preference in the form of a carbonate) in such proportion that it will absorb the nitroglycerine, and form a dry compound. In preparing this compound they have found a good result may be obtained by adding 25 parts of carbonate of magnesia to 75 parts of nitroglycerine. The compound thus prepared, besides being safe to handle, may be produced at less cost than compounds of a similar character at present manufactured.

It is an acknowledged principle of law that if a man patents an alloy of 75 per cent. copper with 25 per cent. of aluminium it does not cover the use of 75 per cent. of copper with 25 per cent. of any metal other than aluminium, and that if he claim an alloy of 75 per cent. of copper with 25 per cent. of "any other metal" the patent will be altogether invalid. The dynamited claim appears to be in direct opposition to this law, and renders the Act of 1852 a dead letter. Perhaps some correspondent can suggest a means of avoiding the difficulty, and of thus preventing the miners being compelled

to use a dangerous instead of a safe explosive for nearly two years longer.—May 12

SAFETY.

ELECTRIC LIGHTING.

SIR.—I beg to annex an extract from the final specification of my patent for improvements in distributing Electricity for the production of Electric Lights, which has just been deposited at the Patent Office, and I shall esteem it a favour if you will kindly call attention to my invention in the columns of your valuable paper.

Coventry-row, May 13. CHARLES STEWART, M.A.

Extract from the final specification of Stewart's patent for improvements in distributing Electricity for the production of Electric Lights:—The object of my invention is to enable the electricity generated by a dynamo-electric machine (or obtained from any other source) to be distributed through a number of circuits in succession in such a way as to permit of one or as great a number of electric lights as may be required, or found practicable, being established and maintained in each circuit by means of electric lamps. In carrying out my invention for lighting a town there would be a number of Gramme or other dynamo-electric machines, or other apparatus, for generating the electric current or currents at a central station, and separate main wires or cables of wires would be led from these electric machines to a number of district stations, one to each, or the Gramme machines might each be located at its corresponding district station if preferred. At each district station there would be a switch or commutator worked by any suitable motor for distributing the flow of the electric current to the different branch wires or circuits on which the electric lights are to be established, as hereinafter described. This switch or commutator is kept in motion at a constant speed for putting all the branch wires in connection with the main circuit at regular and rapidly recurring periods of time. It comprises a rapidly rotating arm terminating in a spring contact, which passes over and presses lightly upon a number of metallic contact pieces or pins insulated from each other and distributed at equal intervals around the face of a disc, and equal in number to the number of branch circuits in which the lights are to be produced in the district. The main wire or cable from the Gramme or other machine at the central station is in electrical connection with the arm of the commutator through its axis. Now, as a luminous object remains for about one-eighth of a second upon the retina of the eye, it is evident that any object which is seen more than eight times in a second will appear to be constantly visible. If, therefore, the commutator arm rotates (say) 60 or more times in a second, a current of electricity will be sent through each of the branch wires 60 or more times in a second, and if one or more suitable arrangements of carbons or other appliances for establishing the electric light be interposed in the circuit of each branch wire the several lights will appear to be constant, notwithstanding that the flow of the current is intermittent, it being, in fact, interrupted at the rate of 60 or more times in a second. The electric light or lights on any one or more of the branch circuits may be dispensed with by breaking those circuits without in any way interfering with the others, or necessitating any alteration in the working of the commutator.

THE ELECTRIC LIGHT FOR DOMESTIC USE.

SIR.—It has frequently been asserted, and no doubt correctly, in the *Mining Journal* that the subdivision of the current employed for electric illumination by placing several lamps in one circuit promised but little success; the difficulty, however, appears to have been entirely overcome by the invention recently patented by Mr. JOHN CLARK, telegraphic engineer, of Kensington. He subdivides the current, of course; but it is by what may be called a natural subdivision instead of an artificial subdivision, the effect being that every lamp is equidistant from the generator, and receives its current quite independently of the remaining lamps. In fact, in the usual systems the lamps, to use a popular explanation, are on branches from the main current; but in the Clark arrangement each is upon a portion of the main current itself. Mr. Clark's first object is to subdivide a strong current of electricity or magneto-electricity into any required number of lesser currents of equal tension; and, second, to use such lesser currents for producing an artificial light suitable for domestic and other ordinary purposes, to which light by gas or other means is at present applied, by conducting the lesser currents through a suitable illuminating medium placed in the circuit of such currents.

The method by which he accomplishes this is so simple that it is surprising that it was not thought of before. He fills or partially fills a bath with mercury, and immerses therein the ends of any number of wires of any suitable metal or metals which are conductors of electricity for the said lesser currents. In some cases he coats the ends of such wires where they dip into the mercury with silver or other metal to cause them to make electric contact more certainly. In certain cases he also solders or brazes the ends of the said conducting wires together in a pile and dispenses with the said mercury bath. The said conducting wires he prefers to make of a uniform length, or nearly so, irrespective of the actual distance of the several places to which such wires lead for lighting purposes, his object thereby being to attain a uniform resistance in the several wires composing such pile, and thus to subdivide the greater current of electricity into a number of lesser currents, corresponding with the number of wires in such pile of an equal resistance each to each, or nearly so. He connects with the mercury bath or with the soldered pile of conducting wires the main conducting wire or wires for conveying the electricity or magneto-electricity to the said bath or pile. The main current or currents of electricity or magneto-electricity he produces in the ordinary manner by any machine or apparatus suitable for such purpose.

To produce the electric light instead of using solid carbon or charcoal in rods or plates, as is usual, Mr. Clark uses them or other illuminating media in a finely divided state as dust or powder between strips of glass or other transparent or semi-transparent material, or such glass or other material may be tubular, having the said dust or powder placed inside; or any other suitable form of glass or other material may be used, his object being to keep the said dust or powder from contact with the oxygen of the air, and to keep such dust in a compacted state as required. To more effectually protect such dust or powder from being acted on by oxygen gas he also encloses the said glass strips, tube, or other transparent material in a larger outer globe of any suitable kind, and fills the said globe with any gas other than oxygen or its compounds. In some cases he prefers to use instead of the dust or powder described asbestos, either as powder or in a compact state, or compounds formed with it, or the chromate of iron ore, or the bichromate of potash.

Not having myself seen the apparatus in operation I cannot quite understand how he produces the lights, and I am inclined to think that these tubes and powders will have to be abandoned; but the method of subdividing the current is so good that it would be equally applicable to any of the incandescent systems—Wardner's, Reynier's, or other—and should be at once tested on a working scale. He states that the conducting wires previously described for the lesser currents are each fitted to conduct electricity or magneto-electricity, so that it will pass through a stratum or portion of the said dust, powder, or asbestos, and in consequence of the current so passing it illuminates such stratum to incandescence to produce electric light in connection with each wire of which the said pile or group is composed. When he uses asbestos in a compact form he may dispense with the strips or tube of glass or other transparent material previously described, as these are mainly intended to keep in a collected state the illuminating medium when used as dust or powder. The property of asbestos to resist destruction by fire is well known, and he finds it very suitable for durability when applied as an incandescent medium for producing the electric light. In using asbestos he does not always operate with it through a number of wires or other suitable conductors of equal length as described, for in some cases he uses a single main wire with a succession of breaks in it, and places in such breaks short connecting pieces of asbestos or its compounds, either in powder or compact, in order to keep entire the conductivity of the said main wire, so that by passing a current of electricity or magneto-electricity

tricity along such main wire the said pieces of asbestos are illuminated simultaneously by the passing of such current.

When he subdivides the main current of electricity or magneto-electricity by passing through it a number of wires of equal length as described, he in some cases modifies this arrangement by making some of the wires shorter in the pile or group and of different metals, the shorter wires being metals of less conducting power than the longer wires of such pile or group, or by making some of the wires of the pile or group of less sectional area at a part of their length; in both cases he obtains a uniformity of resistance to the electric current in the several wires grouped together to form a series. For the same object in another modification he makes a break in each wire in the series and immerses the separated ends in a bath of acidulated water or other liquid of less conducting power than the metal of which the conducting wires are made, or he inserts such separated ends in a receiver filled with charcoal dust or powder similar to that described for producing the electric light. The ends of the said wires are adjustable at the breaks as to their distance apart, so that instead of maintaining a uniform resistance in the pile or group of wires by making them of a uniform length as described he attains the same object by making the said wires of unequal length and adjusting the breaks in the said bath, or by compressing the said charcoal dust or powder by screws fitted to the said bath or receiver, or by other suitable means, to obtain a uniform resistance in such conducting wires forming such pile or group; or he adjusts the ends of the said wires where the breaks occur for the illuminating medium to be placed.

That Mr. Clark's invention is perfect I will not say; but that it has novel features which are worthy of careful development will, I think, be obvious to all who have given any attention to the subject. What is required is the subdivision of the current without waste, and this has not hitherto been accomplished. The Werdermann lamps produced only 10 lights of 8½ candle power each, or 85 candles in all, with a current that one instant before two large lamps had given 320 candle power each, or 640 candles in all; yet this is about the best result that has been attained. If Mr. Clark can give 10 lights of 64 candles each from such a current his success ought to be assured.—*Kensington, May 13.*

ELECTRIC SIGNALLING FOR MINES.

SIR,—Although it has several times been suggested that it would be desirable to use electricity for communicating between the surface and the underground workings, there have been many practical obstacles which have prevented its adoption. There was no difficulty in obtaining the electricity or the apparatus, but the notion of teaching the colliers to read the signals, even when they could read at all, was out of the question, and thus electric communication possessed no advantage over the old knocker-line, for one, two, or three bells was all that could be made intelligible. The telephone and the microphone have altered all this, for electricity can now be used to communicate with the underground man in his own vernacular. Had it been possible to communicate a verbal message to those entombed at the Hartley pit some twenty years ago nine-tenths of the lives lost might have been saved, and many other cases have occurred both in this country and on the Continent where telephonic communication would have been invaluable.

The new microphonic speaking apparatus recently invented by Mr. C. F. Valey, of Rue St. Lazare, Paris, would be invaluable for such purposes, and will, in my opinion, be largely used as soon as it becomes more known. For the purpose of transmitting spoken words to a distance through a telegraphic line wire or conductor, he employs an instrument similar to the microphone, and this instrument he encloses in a case in such manner as to protect it from all disturbing vibrations, and leave it to be influenced only by vibrations set up in the air confined in the case. One side or portion of the case consists of a thin plate or diaphragm, which vibrates to the voice of a speaker and imparts similar vibrations to the air within the case. The microphonic apparatus consists of a cylinder of carbon, pointed at the ends, and two plates also of carbon having small depressions in them, into which the points of the first mentioned piece are received, so that the cylinder is held loosely between the plates. The case may be of wood, and the carbon plates are attached to its sides, a thickness of caoutchouc being interposed to check the transmission of vibrations. He prefers to make these plates from the carbon or graphite taken from gas retorts, whilst for the pointed piece of carbon which is sustained between them he prefers to employ the prepared carbon known as carbon Carré. The thin plate or diaphragm which completes the enclosure may be of thin iron or mica or other material, which will respond to the voice tremour. A mouth-piece is provided immediately over this plate or diaphragm to concentrate the voice upon it.

The microphonic apparatus with its case arranged as described is supported upon a base, within which a dry pile is enclosed. The pile he employs is composed of chloride of silver, zinc, and carbon, and the current derived from this pile is led to two metal standards, between which the case containing the microphonic apparatus is held. The standards receive pins projecting from the sides of the case and serving as axes, about which the instrument may be inclined. Sometimes he varies the arrangement by enclosing both the microphonic apparatus and the dry pile in the same case, which may be so formed as to be conveniently held in the hand whilst in use. Sometimes in place of arranging the microphonic parts in the same circuit with the pile, he employs an induction coil, the primary of which is in connection with the pile and the secondary with the microphone. It will be seen that the apparatus is quite simple, not liable to derangement, and likely to prove very efficient. A. R. *Gateshead, May 13.*

MINING IN NORTH CARDIGANSHIRE.

SIR,—Having heard of several discoveries of ore in the above district, I thought I would go and see for myself.

The first mine I visited was the Blaen Caelan, where I found that in driving the 30 fm. level east towards a winze they had cut a very fine course of ore, not only worth over 2 tons to a fathom, as claimed by their agent, but in a much improved country rock to that seen at surface, and generally giving every indication of permanency.

I then went to see the new discovery at Talybont Mine. This was made at surface, and is looking most encouraging, especially when it is considered that this mine has already produced upwards of a million sterling in value of silver lead ore, and that this new discovery is on a parallel lode to the rich deposits already worked. This discovery has created a great deal of excitement in the district, and the ground both to the south and west has been taken up by influential local people. A little further north is the Tan-yr-Alit Mine, which, although worked to only a very shallow depth, has turned out within the last few years a good deal of mineral, which is a very solid steel-grained silver-lead ore. I notice they have a parcel of 15 tons now being delivered. East, again, of the latter mine work has been commenced at the Penybanc Mine, and some very rich stones of ore are to be seen at surface, which were broken really in the Penpompren grant, though within a short distance of the boundary. Penybanc has a good reputation, but unless worked in connection with the Moel Goch Mines—i.e., Penpompren and Erglwd—as it was before, can never pay. Coming on to the last-mentioned mines I saw some very nice specimens of ore at surface in more places than one.

These mines have been extensively worked for some time past, and a considerable sum has been paid in royalty, as the books of the landlord can testify, and I am informed that an influential company has now taken a lease, and intend shortly to commence operations. I was told that a very rich discovery had been made at the Ynys Mine, which lies further north. I saw the stuff at surface, which is a galena ore of great purity, but I was unable to see the bottom of the shaft, as it was full of water, but some of the miners who had lately worked there informed me it was a splendid course of ore, and, from every indication at surface, I should say this is very likely to be the case.

I cannot conclude this article on the North Cardiganshire mines without referring to the great discovery made some time back at

Camdwr Mawr (I saw it about four months ago), which having been proved to a depth of about 15 fathoms on two shafts (say 30 fathoms apart), and to a value of at least 4 tons to a fathom, is now being cross-cut from the lowest possible level, the cross-cut having to be driven about 75 fathoms before it intersects the lode, which runs a little to the south of east to the old Camdwr Mawr Mine, and to the north of west to the Haven and Henfwrh Mines. I am unable to say anything about the Cambrian Mines, not having as yet seen them, although I have heard good reports of them.

On the whole, the North Cardiganshire district appears to be just now in luck, one good discovery not unnaturally stimulating others to search more vigorously, and thus in turn leading to fresh deposits of ore being found.—*May 15.*

THE MINERAL DISTRICTS OF CORNWALL AND DEVON.

SIR,—The base and principal of the rocks occurring from Land's End to Dartmouth—a distance of over 90 miles—is granite; it is overlaid generally by other rocks, but it appears also at the surface in several parts of the district, forming hills of from 500 to 1500 ft. in height. What may be called true granite is obtained from the Lamorna Granite Quarries, near Penzance; the quartz is perfectly crystallised, the felspar and mica also being found in their original crystalline condition. The rock called elvan in Cornwall is composed of the same three minerals, but the crystallisation is not so complete as in granite. Elvan is considered to be a mineral intermediate between granite and porphyry, the felspar only being crystallised, though sometimes it contains crystals of quartz and mica. China stone is granite much altered, the felspar being in a decomposed condition, and the quartz indistinct. China clay is much the same, but is much further decomposed than china stone, the felspar being quite altered into clay. Clay slate, locally termed killas, is found in three varieties, one sort occurring near tin and copper lodes, the second occurs where no metalliferous veins exist, and the third in the districts where iron ores are found.

The copper ores in the lodes of Cornwall vary much in their yield; the yellow ore, containing about 34 per cent. of metallic copper, is the richest. The lodes in some parts contain very little ore, being filled with veinstuff of little value; they may thin out to a mere string, and again swell out, and rich bunches of ore will be found. It has often occurred in the Redruth and Camborne districts that lodes which were rich in ore at the higher levels have become poor at greater depths. Dolcoath Mine in this district was once one of the richest copper mines in England, but from 130 to 180 fms. below the adit the produce became very poor; below that depth it has yielded large quantities of tin. The present lower level is 314 fms. below the adit and 350 fms. from surface, and is very rich in tin.

The great fact that the metallic lodes accumulate at and about the junctions of the granite and killas is now well known both with respect to copper and tin lodes. The great depth to which Dolcoath, Tincroft, Cook's Kitchen, and other mines have been worked has also brought out this fact with regard to the change of ores. These mines were originally worked mainly for copper, though occasionally tin had been raised, but as greater depth was reached the quantity of copper diminished, while the quantity of tin increased. It is thought by some experienced men in Cornwall there is no limit to the depth of which a mine may be worked as regards the existence of tin, holding that the deeper the shafts are sunk the richer would tin mines be found. One difficulty in working copper mines in other parts of the county had been the great heat at great depths. At the Consolidated Mines, in the Gwennap district, the heat was very great in the lower levels at about 300 fms. from surface. In the United Mines, in the same neighbourhood, a hot spring was met with in the bottom level, about 250 fms. deep; the temperature of the water was as high as 115° Fahr. The pumping of water and the difficulty of obtaining efficient ventilation, with the low price of copper, have had the effect of stopping the working of these mines. In the Gwennap district there is no instance in which there is that great increase of tin with depth as has been referred to as occurring in the Camborne district. The deep mines in Gwennap district are now under water, and seem likely to remain so.

The lead mines of Cornwall are somewhat remote from the principal mining centres. In the district north of Truro there have been some valuable lead mines—the Shepherd's Mine and Wheel Rose. In the Chiverton district there were still rich mines, not only in lead, but in the large proportion of silver the ore contained. These mines were in rocks of a different lithological character from the killas of the copper and tin districts, but the same killas ran in and out very near them. There are lead mines also south of Truro and to the south-west of Helston. In the eastern part of the county was the Liskeard district, rich in lead ore, near which was Herodfoot Mine, remarkably rich in the amount of silver contained in the ore.

The iron ores of Cornwall have not yet been worked to a great extent, owing in a great measure to the want of facility for its carriage to shipping ports. It is known, however, that lodes of iron containing hematite ores of great value do exist with smaller quantities of magnetic and spathose ores. The great Perran lode is known to extend from the coast near Perranporth to several miles inland, and is found 30, 60, and 100 ft. wide in some places. Other lodes, varying from 3 to 15 ft. in width, are known to extend many miles in length. The chief supply of iron ore in England for the manufacture of Bessemer steel has been obtained from the red hematite districts of Cumberland and Lancashire. The red ore found in Cornwall is inferior to that of Cumberland, and the quantity available is limited. Brown hematite is more plentiful. Many iron mines have been worked in the central and northern parts of the county. The Restormel Mine, near Lostwithiel, has produced in one year 30,000 tons. A period of activity in iron mining is likely to arise if better facilities of transport are obtained. These mines, it is believed, will realise the expectations formed of them, and make up for the falling off in copper and tin mines. The brown hematites of Cornwall are said to be too silicious for iron making; this objection can be remedied by crushing and washing. When crushed small, however, the ore is unsuitable for blast furnaces; it may, however, be made available in other processes of iron making.

MINERAL LODS.—The mean direction of tin and copper lodes in Cornwall has been given by Mr. Henwood in different districts as follows:—

St. Just... 35° S.E. or N.W.	Redruth... 22° N.E. or S.W.
St. Ives... 8 ditto	St. Agnes... 22 ditto
Gwinear... 2 ditto	St. Austell... 13 ditto
Marazion... 1 N.E. or S.W.	Caradon... 18 ditto
Helston... 16 ditto	Tavistock... 9 ditto
Camborne... 20 ditto	

The lodes bear usually nearly east and west, the average bearing in Cornwall being about 5° north of east. The greatest deviation from this is in the St. Just district—35° south of east—as given above. Some of the lodes are nearly vertical, but most of them incline or underlie. The mean dip may be stated at 20° from the vertical. The average width of the lodes is about 4 ft.; but they vary in bearing as well as in dip, frequently splitting into branches, and these branches may again unite.

Of the different veins of ores, quartz, and clay some are more ancient than others. They were divided into eight groups by the late Mr. Carne in 1822, according to their relative ages. The oldest are conjectured to have been formed in carboniferous times; the latest in post-glacial times.

The material of the lodes (in which ores of copper, tin, and lead are found) contains in general but a small proportion of saleable produce, not more than 1 per cent. of the whole mass; the portion raised to the surface rarely yields more than 2 to 4 per cent. of saleable matter.

ADITS.—These serve to drain high grounds, and also to carry off the pumping from deeper levels. One adit is often made to drain many mines by means of branches. One such adit in Germany, recently completed, is 14 miles in length. The great county adit of Cornwall is situated near Redruth; with branches it is about 30 miles in length, and was constructed by Mr. Williams, of Scorrier, more than a century ago. Many of the mines for which it was constructed are abandoned, so that its importance is not so great as it formerly was. A few years ago it drained an area of 5550 acres, discharging on an average 1450 cubic feet of water per minute, or 9033 gallons.

The duty of Cornish pumping-engines has fallen off greatly during the last 30 years. The Mellanear engine for many months in 1873 pumped as much as 1160 gallons per minute, going at the rate of 12-2 strokes per minute, including stoppages. The average duty was 49 million ft.-lbs. per cwt. of coal used. In the same year the duty of the Dolcoath 85-in. engine was 65-6 millions, working 4-4 strokes per minute. Each engine is supplied by four Cornish boilers, the steam being at 40 to 45 lbs. pressure. M. E.

COUGHT OUR MINING POPULATION TO BECOME SHAREHOLDERS IN MINES?

SIR,—It is impossible to give other than a qualified answer to the question heading this letter, whether affirmatively or negatively. If many of our mining population—by which I understand working men is intended—could afford to adventure in mining it would still be question that they themselves should resolve whether they ought to or not. One of the soundest propositions I know bearing on the subject is this—that no one is justified in adventuring beyond what he or she could afford to lose without sustaining any embarrassment in his or her business, family, or general circumstances. It is not to be supposed that very many working men are in such circumstances as enables them to speculate in losing enterprises without entailing upon themselves and their families some kind of inconvenience, if not of actual discomfort. No one sets a greater value on the acquisition of his own labour than the frugal working man does. It came not to him lightly, and he does not lightly part with it. If I may venture an opinion, it is that we have already too many poor adventurers in mines. What appears to me to be needed is a class of men who, after making due enquiries, embark in a venture and prosecute it on its merits. It is then that they take a personal interest in their enterprises, and contribute by all the means in their power to its development and success. It is not the capital, knowledge, or influence of working men that can do much for the amelioration of mining. They have too little of the former, and are too much divided amongst themselves in matters of opinion to make their knowledge and influence very effective. The lack of confidence also in their own resources would render them diffident in expressing the views they entertained on specific points in the presence of those they esteemed as their superiors.

What, then, is to be gained by such an accession of numbers—if, indeed, it could be accomplished, which is more than doubtful? What is needed in mining is not so much money as the necessary knowledge and a proper disposition in applying it. There is quite money enough, I am convinced, subscribed to mining to develop the resources of the country as fast as they need and ought to be developed, if properly disposed of, but the truth is that numberless schemes are set afloat, and dignified with the title of mines, which ought to have remained in undisturbed obscurity; whilst, on the other hand, numerous prospectively promising and inviting properties are overlooked or neglected from the want of a due appreciation of their merits. To include working men of mining communities in mining adventures would necessitate a sort of co-operative system, to which each member would be called upon to contribute in proportion to his interest in the proposed adventure, and as labour is, in the generality of cases, the working man's only capital, his means of subsistence are wholly dependent on the interest derivable from its application. And as it is well known in too many instances that that is insufficient to provide for themselves and families the necessities of life, to say nothing of its comforts or conveniences, it is difficult to realise in what way an accession of such numbers would tend to the improvement, elevation, and stability of speculative or practical mining. There is one role in mining in which at first sight it might be considered that working miners could play an important part, and that is as pioneers—"prospectors" in mining enterprises—but that also, as matters are in this country, necessitates an outlay, and sometimes a very considerable one, and being of itself an absolute speculation there can be nothing inviting in it for men of no means, or even for men whose means are limited or precarious. Besides, the owners of land in this country will not grant mining concessions except to men of substance or considerable influence. And if they would it is, as I have already intimated, more than doubtful that the working men—those of them I mean who by dint of industry or good fortune possess a little means—would be inclined to speculate in so precarious an enterprise as incipient mining, and to invest in well-established undertakings is beyond their means except to a very limited extent and very exceptional instances.

ROBERT KNAFF.

Llanrwst Lead Mine, May 15.

BELL VEAN MINE.

SIR,—My anticipations, expressed in a former letter, as to the productiveness of Bell Veau are being realised. In driving a cross-cut southward from the adit level a new lode, before unknown, has been intersected, and is found to be about 5 ft. wide, and yields tin ore of very high produce. I was at the mine on Saturday, and saw a sample of 8 ozs. taken from the lodestuff without selection, and vanned, and the produce was 1½ oz. of black tin—that is to say, the tinstone yields nearly 25 per cent. The miners are driving westerly on the lode, and the resident agent says that it improves as they progress. This discovery was quite unexpected, because the lode was and is unknown at surface, and the cross-cut was intended to intersect the Gobban lode, which is further south. This new lode must add considerably to the value of the mine, and shares will naturally rise in value. The steam stamps on the mine will, I am told, be set in order shortly for reducing the tinstuff, that the tin may be prepared for the smelting house. It is pleasing to find that after a long and severe depression we are encouraged by discoveries to prosecute our mineral labours. Gwennap is far from a state of exhaustion. Prosperity will, I hope, set in again. R. SYMONS. *Truro, May 8.*

EAST LLANGYNOG LEAD MINING COMPANY

In the High Court of Justice an action was brought by Mr. Ashley, the holder of shares in the East Llangynog Lead Mining Company against the promoters of the company, Messrs. Joseph Taylor and Charles Rule, and the representative of Mr. J. P. Endean, the third promoter. The plaintiff alleged a conspiracy between Messrs. Taylor, Rule, and Endean to inflate the value of the shares by the method adopted to bring out the company and by puffing it in private journals; and he claimed 500l. damages in respect of the purchase by him of 100 shares, which he had bought from a man named Hawkes, and which belonged to and were transferred by Mr. Endean. The company was formed in December, 1870, for the purpose of working a lead mine, which had up to that time been called the Craig-y-Mwyn Mine. It had been worked more or less for a long period, but no profit had been made for a considerable time. In December, 1868, a lease of the mine from Earl Powis was acquired by Mr. Rule. Soon afterwards an agreement was come to between Messrs. Rule and Endean by which the latter, in consideration of "service rendered in respect of the property," was to have a 12th (subsequently increased to 5-8ths) of the vendors' shares in any company that should be brought out, and was not to interfere in the formation of such company. In the autumn of 1870 negotiations were begun between Mr. C. Rule and Mr. J. Taylor, who then carried on business as a mining agent at Manchester, which resulted in the formation of the company in question. On Dec. 1, 1870, an agreement was executed which gave Taylor the option of purchasing half the mine for 10,000l. He rejected this option because he thought the terms of purchase not sufficiently favourable; and on Dec. 8, 1870, a further agreement was made by which the mine and plant were transferred to Taylor and another trustee for the proposed company at the price of 90,000l., to be paid in shares; and two days afterwards an agreement was made between the two that Taylor should receive 25,750 2l. paid-up shares and 1750 2l. shares with 1l. 10s. paid up, at the price of 6000l., which was only to be paid when Taylor should have sold 10,000 shares, or realised 20,000l. The company was formed with a nominal capital of 100,000l. in 50,000 2l. shares, the whole of which was distributed between Messrs. Taylor, Rule, and Endean as vendors' shares, 90,000l. being treated as paid-up. Of these Taylor received the number stipulated for; Endean received 2600 fully paid-up and 3495 30s. paid shares; and Rule kept the balance, 3750 fully paid-up and 14,754 30s. paid shares. The plaintiff was a retired solicitor. He alleged that he was partly induced to take the shares from statements contained in a number of a trade circular issued by Taylor, entitled "Taylor and Company's Mining, Exchange, and General Shareholders' Guide," but so copy of such circular could be produced and no precise evidence of the contents was given. The strongest evidence put forward by the plaintiff was that of Hawkes, from whom he had bought the shares. Hawkes took an office in Royal Exchange Buildings in 1871, where his rent was guaranteed by Endean, and Endean agreed to sell to Hawkes within three months a number

It was then moved by Mr. G. G. MACKAY, and seconded by Sir CHARLES CLIFTON: "That the sum of \$8,479, 8s. 6d., now standing at the debit of the revenue account, be passed off to the debit of reserve account."

This was carried with only two dissentients.

The CHAIRMAN: Our next business is the re-election of directors to fill the vacancies caused by the retirement of Mr. Henry Detsch and Mr. L. G. Dyes. These gentlemen being eligible for re-election, I beg to move that they be re-elected accordingly.

Mr. MACANDREW seconded this, and it was carried unanimously.

The re-election of the auditors was moved by Mr. Oldershaw, and seconded by Mr. Skinner.

Mr. DUNDAS: Do Messrs. Turquand, Youngs, and Co., audit our accounts themselves, or do they leave them to clerks? They have so much business to do that it is stated that they are compelled to leave most of their work to clerks.

The CHAIRMAN: It is an entire mistake. The members of the firm have always paid special attention to the affairs of this company. (Cheers.) It is not to be expected that they personally count the coupons or details of that kind; but with regard to the investigation of the accounts they are personally attended to.

Mr. DUNDAS: With that explanation I most cordially support the re-election.

The resolution was then put, and carried unanimously.

Mr. CORNER: I do not think we should separate without most cordially thanking the Chairman and the directors for their most careful attention to the affairs of this company. (Cheers.)—Mr. DUNDAS seconded the motion, which, on being put to the meeting by the mover, was carried with acclamation.

The CHAIRMAN: We are exceedingly indebted to you for the kindness and confidence which you continue to place in us. I can only repeat what I have said, that our most earnest and untiring efforts will be used to bring this company into a satisfactory condition. It is with infinite pleasure that we meet you to-day in the sure and certain prospect that our bad accounts are at an end, and that we shall in the future have very different meetings from what we have had in the past. (Cheers.)—The meeting then separated.

CHONTALES CONSOLIDATED MINING COMPANY.

The half-yearly general meeting of shareholders was held at the offices of the company, Gresham House, on Thursday.

The Right Hon. Earl NELSON, the Chairman, presiding.

In the notice the directors stated they had decided to convene the meeting earlier than usual, as they were very desirous of having an opportunity of conferring with the shareholders previous to the departure of the next mail, as it was essential to the interests of the company that funds should be immediately provided.

Mr. J. JAMESON THURAN (the secretary) read the notice calling the meeting.

The CHAIRMAN said the directors were very sorry to have to summon the shareholders together at an earlier date than usual, and without the published report from the mines, but the reason was that, from the bad returns which had recently come from the mines, the company was in such a position that if the debentures were not taken up the directors felt it was impossible to go on. They had been obliged to call this meeting before the mail went out, in order to give information to the manager only.

But before doing that he wished to point out to the shareholders what had so materially altered the position of the company's property. When they last met, on Nov. 28, they had the information before them that in July they had received 1100l. from the mines, in August 1140l., in September 1280l., in October 116l., and all these returns gave the directors every reason to believe that they were going into a great success; and, in consequence of that, the directors did not press further for the payment of the debentures which they had asked to be subscribed. But a very small sum had been sent in answer to the appeal, and, as he had said, the directors did not press for more, because at that time they entertained the hope that they would receive such returns from the mines as would actually enable them to set apart a sum for the paying off of the small amount of debentures they already had. The directors stated at the last meeting that they contemplated sending out another engine, but before doing so they thought it necessary (in consequence of a remark being made in one of the last letters at the time from the manager) to hold their hands, and to write to him more fully on the subject. The directors afterwards understood that they had misunderstood the manager on that point, and that it was perfectly easy for him to repair the old engine and bring it out there, and that for the company to commission that it did originally, and the sending for the money was also attended with great expense, and took up a great deal of the time of the cashier, who, with another man, had to go each month to get the money up to the mines. Another thing was that the money at times had not come at the proper time, and, as they had not a month's money in hand, the natives were obliged to wait for their wages till the money came in; this they did not like, and many went away from the mine to other employment. As soon as the directors heard this they put forth a fresh appeal for debentures, and if that appeal had been responded to the directors would have been able to have remedied that state of things, and to have returned, as they hoped to do, to specie payments. But, unhappily, the appeal was not well responded to. Since then there had been fresh bad returns from the mine—647l. in January (which was a drop down from 853l. in the previous month, 601l. in February and in March to 550l., which was a trifle better than the previous return. He should like to say a few words as to what they believed to be the cause of this falling off over and above the fever which he had mentioned, and which had now passed away. There was no doubt there were two causes, because from the last letter there was no doubt that in many of the workings the manager had come upon hard ground of barren stuff called bars. From each of the two mines at present at work the report referred to these hard bars of ground, and there were certain portions of the stuff which, by testing on the spot, he did not consider would pay to send to the stamps. But in addition, there was another portion of the stuff which he sent to the stamps from the two mines, and he was surprised, as the directors were, that this stuff when it came out was of a much lower quality than it had previously been. There was one thing which struck the directors at once as very curious—that this falling off was very uniform; that was to say, that whereas the workings in the Estrella were bringing in 5 dwts. per ton, in San Sebastian 4½ dwts. per ton, they had dropped down to 3 dwts. in the former, and to 3 dwts. in the latter. Another feature had occurred in reference to the property. When Mr. White got round a little the directors sent him orders to forward specimens of the tailings, in order that they might be assayed in this country, and the directors were, he could assure them, very much astonished with the tremendous quantity of gold which was worked out of the tailings. But the shareholders must not jump too sanguinely at the report of what might be got out of the tailings, because it was one thing for a man to manipulate a small quantity of tailings with minerals in this country, and another to treat them as they were obliged to treat them in the colony. The tailings were very desiccated, and one man could get out of them much more than another man could. The directors immediately consulted Mr. Darlington on the subject, and he said that no definite opinion could be formed with regard to it until a larger quantity of tailings was sent home from the mine. That larger quantity had since been sent for and received, and the directors had requested Mr. Darlington to go thoroughly into the matter, and thoroughly test the tailings. There was one other curious thing which had been found out; he hoped, but he could not commit himself, that this might account to some extent for the falling off in the yield of gold from the tailings. In December the directors wrote to Mr. White, telling him about the tailings, and Mr. White received in January. In a letter written on Feb. 9 Mr. White expressed his great concern about the loss on the tailings, but did not state that he had done anything in consequence of it; but the directors noticed that the specimens of tailings sent by the next mail were very much finer than they were which had been sent before, and the directors had got into their mind that really it would turn out that the cause of the falling off of the produce of the mine was that in his desire to improve the tailings Mr. White had crushed the ore finer, and done more harm than good, and what was really wanted was not to have them crushed so fine, as there was a fear of the gold running away. A gentleman who called at the office was shown some of the tailings who immediately remarked—"It is too floury; you lose too much; there are no pyrites in it, and you lose all the gold from the particles being too finely crushed." Another day Sir Leopold Heath, the Chairman of the Javal Company, remarked about the tailings of their company; they were crushed too fine and were too floury; and Sir Leopold had promised to let them know the result of any improved mode of treatment, and he was sure the directors, in return, would be glad to let Sir Leopold know the result of any mode of treatment adopted here. In his own mind he believed that was one great cause of the falling off of the produce of a great deal of the mine. There was no doubt they had got into hard parts as well, but that was incidental to mining generally. Another important point, judging from the letters received, was that Mr. White had no idea that the mines were going to be permanently bad. He would now read the report for the half year which ended Dec. 31 last:—

Mines: San Sebastian: Rose in the different rises, 60 varas; total stopping, 4051 suble varas; drove main level, 3 varas. When the lode here became very small and poor, so that I was not sure that we had the main part of it, but at surface, east of the present end, I found a pit sunk on the back by the natives, where the lode was about 4 ft. wide; the pile of quartz broken and left at the mouth of the pit was worth quite 4 dwts. to the ton. By this I was induced to stop the end for the time being, and put up a rise to prove the lode, but, unfortunately, the men were immediately taken with fever, so that little or no progress was made until in the past month, when we rose in the new rise 19 varas, where we now have the lode about 4 ft. wide, but have not yet got into the shoot of gold. In six weeks more I hope to get the rise through, and be in a position to open fully on the lode, when I expect to greatly increase our returns, and bring us again into a position to make profits. Total quartz raised from San Sebastian during the six months, 3427 cars, or 7869 tons, worth on an average 4½ dwts. per ton. The stopping ground during the last six months has been hard, and not producing sufficient gold to pay the working cost. The cost of stopping in the mine is also much greater than that of stopping from the bank of the lode or taking material from the surface, as in the mines the stopes have to be timbered to keep the ground open for taking away the lode, and afterwards, when open to any great extent, must be filled from

surface, or the height of ground would crush the timber, then the stopes must come together, and have to be abandoned before half of the quartz could be taken out, and as we have now gone to the expense of putting the stopping ground and mines throughout in good working order I am unwilling (as yet) to stop any point of operation, as I hope the stopes will again improve. To have worked at all during the past (considering the state in which I found both mines and machinery) I could not have ordered less machinery or gone to less expense in working, and had the quartz continued to produce 5 dwts., and the lode good for progress, we should now be in a good position, but, unfortunately, this has fallen through the principal stopes getting into a hard bar of ground. A small improvement in all that is required to make profits. There is no lack of anything but the gold, and, so far, I am keeping everything connected with the working of the mines and the crushing of the ore in quite as good a condition as when making profits, so that when the produce is again a little higher, which I think it will be soon, the cost will not be increased, and profits will be immediately resumed.—Estrella Mine: Drove, 7 varas; rose in the new rise, 31 varas; stopped from backs, 756 cubic varas. Total quartz raised from the above mine during the six months ending Dec. 31, 2915 cars, or 1924 tons, worth on an average 5 dwts. per ton. Total quartz raised from both mines, 9185 tons; quartz accumulated at the mill to June 30, 57 tons; total quartz treated during the six months, 9700 tons, which produced 2322 ozs. of gold, or on an average 4½ dwts. per ton. Total cost for the six months, \$21,678, charged on construction account, \$1200; value of gold, \$19,878; profit, \$11,537.—W. WHITE.

Now, that concluded the half-yearly statement, which should have been in print directly after the conclusion of the half-year he had said, the falling off had been very bad indeed, and there had been a deficit to meet every month, which had reduced them to such a position that unless the debentures were fully taken up it would be impossible for them to go on and do justice to the mines. The directors had done their best to keep up the mines, which were thoroughly timbered and well kept open. Duplicate sets of machinery had been sent out, and the directors were told that the machinery was in first-rate order; but it was impossible to go on from hand to mouth any longer, and, therefore, the shareholders had been called together to decide what was best to be done. He would now come to the news received by last mail. The falling off was still bad, but it was a little gain on what they had last time, but a bad feature was that the cost had jumped to 900l. from 650l. the month before. The particulars of this cost, although sent, had not yet been received by the board, and probably had gone round by New York with the duplicate letter. In his last letter Mr. White wrote that he was paying every requisite attention to the stamps, and was keeping all the stopes and other places in the mine open and in working order, and that with an improvement in the quartz there would be an improvement in the yield of gold. There was nothing in the manager's report which led the directors to doubt the future going on of the mine, but at home the state of things was different. The financial statement was made up to May 15. On the liability side there were acceptances which came due monthly, amounting to 2400l., but against that must be set the returns for each month, so that probably there might be more than enough to meet the acceptances. Then there were the letters of credit which had been sent out, amounting to the sum of 2100l. There were bills for machinery and stores 1143l. 11s. 8d., and one or two smaller amounts, raising the entire liability to 5796l. 13s. 8d. Against that they had to set the cash balance and the debentures not paid, leaving a total balance against the company of 4492l., without reckoning the gold coming from the mine. With regard to the last issue of debentures—5000l.—the directors all took their proportion, but unfortunately the whole amount of subscriptions, including those of the directors, did not exceed 1200l. Previous to the present meeting the shareholders were reminded that money was really wanted, and they were asked to say what they would really do. A large number had said they would do nothing, and the result of the appeal was only to bring the 1200l. to 1970l., leaving roughly about 300l. out of the 5000l. unapplied for. There were other shareholders who had written to say that they would take portions of the debentures conditional on the whole amount being subscribed. The question for the shareholders really to decide was what they intended to do. They could not go on living from hand to mouth. If they were prepared to come forward and subscribe the full amount required, that would be a different and better state of things; but as the directors had done their best in asking three times for subscriptions to the debentures, and as these had not been adequately responded to, he was at a loss as to what was best to be done.

A discussion took place, in the course of which Mr. Parke Pittar, one of the directors, said that they had only sufficient at present to go on for another fortnight, and if the money was not subscribed the directors must consider the desirability of calling another meeting in a fortnight to discuss the winding-up of the company. The debentureholders would take the mines if the company went into liquidation, and then they certainly would not be allowed to cease working. Several shareholders expressed their willingness to subscribe for the debentures conditionally on the whole 5000l. being taken up, and in the end the Chairman said that another meeting would be called in about a fortnight, and they would then be able to see what additional amount of debentures were subscribed, and whether they would be able to go on, or whether the company should be wound-up. A vote of thanks to the Chairman and directors closed the proceedings.

CANADA GOLD MINING COMPANY.—The statutory meeting of shareholders was held yesterday at the offices of the company, Austinfrs, Mr. J. N. Gordon in the chair, when facts and statistics were given which warrant the belief that there is a very prosperous future before the company. A full report of the proceedings will appear in next week's Journal.

SOUTH CARADON.—At a general meeting of shareholders, held at the mine on Tuesday (Mr. RICHARD HAWK in the chair), the accounts for thirteenth month, 1878, and first and second months, 1879, showed a profit of 144, 19s. 3d.; and a credit balance of 2706l. 1s. 3d., which was carried to the credit of the next account. The following report was read:—

May 13.—I am pleased to say the mine continues to look well, so as to enable us to keep up our regular monthly returns of high percentage copper ores, and at present I see no reason to doubt its continuation.—JOHN HOLMAN.

CAPE COPPER.—The accounts for the year 1878, to be presented at the meeting on Wednesday, show that the value of the ore and metal returned was 222,939l. 17s. 7d. The average assay of the ore was 30½ per cent., and the average price obtained has been 11s. 2½d. per unit. The costs were 153,829l. 12s. 5d. The result is a net profit for the year of 69,160l. 5s. 2d., which, with the balance of 22,540l. 8s. from 1877, makes a total profit of 91,700l. 13s. 2d. This profit has been dealt with as follows:—65,000l. has been paid in dividends, 1811l. 18s. 1d. in income tax, 2000l. has been carried to the landed estates and buildings sinking fund, 2500l. to the stocks plant and machinery guarantee fund, and 3000l. to the railway and jetty sinking fund, leaving a balance of profit of 17,389l. 1s. 1d. to be carried forward.

FOREIGN MINING AND METALLURGY.

Although the intelligence received from the French metallurgical district has become more favourable, the Belgian iron trade has remained in much the same condition. A number of works have employment assured to them for some time to come, but prices exhibit a little tendency to additional firmness. Some long-term contracts have been proposed to Belgian firms, but they have not been accepted, as current prices are too low to induce them to do so. This fact may be regarded as a circumstance which affords some little encouragement for the future. The Belgian Government has just approved an adjudication for trucks for the Belgian State Railways which took place at the close of April. In connection with an adjudication of locomotives for the same system, the Belgian Minister of Public Works has called upon the firm submitting the accepted tender to make a reduction of 72l. per 45-ton engine, and of 40l. per 25-ton engine. The Minister will not approve the adjudication unless these reductions are made, and the firms competing propose to confer with him upon the whole question. The John Cockerill Company has secured an order for 4000 iron cross-ties on the De Soigne system. The Liège small arms works are stated to have received an order for 3000 carbines on Dutch account.

The attention of Belgian coalowners has been a good deal directed of late to the increasing amount of competition which it appears likely they will have to sustain. The deepening of the Seine will enable English coal to be carried to Paris without breaking bulk, and the establishment of the great North of France canal will also bring the coal of the Nord and the Pas-de-Calais upon the Paris market upon conditions under which it can compete advantageously with Belgian coal. German coal is also invading the Belgian markets, so that altogether the future of the Belgian coal trade is calculated to inspire some uneasiness. It is noticed as a further aggravation of the situation that the Northern of France Railway Company is granting reductions of tariffs to the Lens and Liévin collieries in connection with deliveries of their coal to Lille, which has hitherto been an important outlet for certain qualities of Belgian coal. Current transactions in the Belgian coal trade have been effected with some difficulty, and competition has held prices more than ever in check. The sugarworks and brickyards have, however, begun to lay in supplies, and a gradual absorption of the stocks formed at certain points is considered to be assured in consequence.

The French coal trade is as inanimate as that of Belgium and England. The business doing is confined to some daily orders which arrive at the mines, but stocks are fully maintained, although the extraction is a good deal reduced. A strike of miners at Lourches has terminated, some concessions of no great importance having been made to the men. The engineer of the company in whose workings the strike occurred is maintained in his functions. Some agitation which had been noticed at Escarpelle has not assumed the character of a strike. The Administration of the

Upper Italy Railway Company is about to invite tenders for the supply of 70,000 tons of coal required during the second half of the current year. Experiments have been made upon the Roman Railway with an American engine, intended to be fed with lignite, and the Italian Minister of Public Works has just decided that similar experiments should be tried upon the Upper Italy Railway. The principal object is to ascertain whether Italian fuel can be advantageously used upon locomotives. We should have stated that the Administration of the Upper Italy Railway has just purchased 30,000 tons of French coal.

The quotations for iron have not experienced much change in the French department of the Haute-Marne; they have, however, been very firmly maintained, and some attempts have been made to establish an advance. In the Nord iron has now secured a well established quotation of 6l. 8s. per ton. Plates have not participated so largely in the upward movement; No. 2 quality are held on the basis of 8l. 8s. per ton, and No. 3 quality at 9l. 4s. per ton. In the Meurthe-et-Moselle, refining pig has remained at 2l. 4s. to 2s. 6s. per ton; casting pig, No. 3, has brought 2l. 14s. 6d. to 2l. 16s. per ton. Rolled iron has made 6l. to 6l. 4s. per ton. In the Loire-et-Rhône the iron trade has not shown any additional animation; there is a certain amount of business passing, but its importance is not sufficient to admit of an advance in quotations. Steel rails were laid down upon the Paris, Lyons, and Mediterranean Railway last year to the extent of 2032 miles of single line. The movement of coal and coke over the Paris, Lyons, and Mediterranean Railway last year presented an increase of 36,000 tons, as compared with the corresponding movement in 1877. On the other hand, the movement of iron minerals over the system declined last year to the extent of 122,000 tons. A syndicate is said to be in contemplation among the ironmasters of the Nancy and Longwy groups. In consequence of the resolution of the Russian Government to give orders for iron only to Russian industrial establishments, the Terrenoire Company has established works near St. Petersburg.

A report on the Belgian metallurgical industries says that the position of affairs continues generally unchanged. A considerable number of works are fairly supplied with orders, but prices are still weak. A good many contracts for long periods are being offered to the iron manufacturers, but the latter consider present quotations so extremely low that they hesitate to commit themselves for any length of time. Meanwhile much attention is being given to the dephosphorising question. Should the new process answer all expectations it will be very important to the iron trade of Belgium, the Belgian ores being for the most part phosphoric. At present the Société Angleur is the only Belgian company which has contracted for the working of the patent. It is understood that a number of German ironmasters are negotiating with the discoverers. During the past two or three weeks there has been a noteworthy increase of activity in the French iron trade, accompanied in some districts, specially the Nord and Paris, by an advance of quotations. In the Haute-Marne and the Meurthe-et-Moselle no advance has yet been made, except by a single establishment, but prices all round are extremely firm. The periodical meetings of the ironmasters, which are henceforth to be weekly in the Nord, are said to have a very good effect upon the market by steadying prices. A syndicate of the producers of pig-iron in the Nancy and Longwy districts is also being formed. In consequence of the measures taken by the Russian Government for restricting orders to Russian producers several French ironmasters have founded establishments at St. Petersburg and in other parts of Russia. An additional enterprise of the same nature is now about to be started in the Ural district, the proprietor being also a Frenchman.

A curious story (the Statist remarks) comes from Germany. It is said that a certain German ironworks—the Ruhrort—tendered rails for the supply of the Dutch State Railways at 5l. per 1000 kilos, being the lowest and the successful bid; but it tendered to the Prussian Main-Weier State Railway, foreign tenders being excluded in that case by ministerial orders, at a sum of 148 marks, or 7l. 8s. per 1000 kilos. It seems that four other works tendered for the Prussian railway contract at the same time, and by an amicable arrangement the five tenderers managed to divide the profits of the operation among themselves. Now, either the Ruhrort ironworks could afford to supply at the cheaper—the Dutch tender—rate, or it could not. If it could there can be little need for protection for the German iron trade; if it could not, the political wisdom which would prompt the Prussian Ministry to pay a high price for its own rails in order that local ironworks should be able to offer rails abroad at a cheap rate seems painfully at fault.

LEAD MINES IN FRANCE.

There are in France 32 lead mines, situate in 16 departments, and producing between them about 9000 tons of ore per annum, which is almost one-tenth of the total production of lead in Europe. The mines of lead, silver, copper, antimony, zinc, manganese, and tin form five groups only:—

The Central Group, which produces 14,522 tons.	
The Cévennes	8,579 "
The Pyrenees	3,354 "
The Alps	2,793 "
The Brittany	1,436 "
Corsica	330 "
Total 31,014 tons	
This total of 31,014 tons is subdivided in the following manner:—	
Lead and silver	9,539 tons
Zinc	7,442 "
Copper	7,336 "
Manganese	4,596 "
Bauxite	1,200 "
Alumite	563 "
Antimony	293 "
Tin	19 "
Cobalt and nickel	6 "

Total 31,014 tons. France imports on an average 15,000 tons of lead ore, of which the value is 210,000l. This is obtained from Italy (7000 tons), Spain (5000), Algeria (2000), and other countries. It is almost impossible to get recent statistical returns in France, in consequence of the existing official reticence, which flourishes under the Republican régime still more than under the Empire.

The lead mines of the Pyrenees are not to be compared with those of the Centre of France. Switzerland, too, possesses rich mines, but which, like those in the Pyrenees, are neglected and unworked. In mining matters the most severe discrimination is necessary; some mines are quite valueless, others are good, and are not yet worked to produce a profit. I have seen some apparently magnificent lead mines which did not pay because their yield was irregular, or because the whole venture required so great an outlay that the undertaking had to be abandoned. The only thing which may recommend a mine in the Pyrenees is that there is no purchase money to be paid. With a few thousand pounds I would undertake to get all the mines which are in the Pyrenees from the Mediterranean to the Atlantic. I would never advise anyone to buy mines there, because it is far more advantageous to work them at a royalty; and with regard to the lead mines, it would be a pity if a company had to pay any money for their purchase. I know all the lead mines of the Ariège, and if I intended working them I could get in a week from their proprietors the right to do so, during 10 or 20 years, without paying any purchase-money, but simply by engaging to pay a royalty of a few francs for every ton of the output, with the option of buying the concession at a nominal price of a few thousand francs when I should find it convenient. What is the difference between the concessionnaire and the proprietor? Why should I waste money and load an undertaking with a heavy charge, when it is so easy to avoid that cost of purchase which so increases the chance of loss, especially when it is doubtful whether the working of the mine will be a success? Suppose, for instance, that a lead mining company had been wound-up or had become bankrupt, after having swallowed a hundred thousand or two, and that the works of the same company were interrupted for 20 years, would it be wise to sink ten or fifteen thousand, or even 4000, to buy such a mine?—Industry.

FREE TRADE AND PROTECTION IN AUSTRALIA.

In connection with the visit of the Governor of New South Wales to the engineering works of Messrs. Hudson Brothers, of Redfern, our esteemed correspondent, Mr. R. D. ADAMS, of Sydney, refers to the importance of the event as showing what Free Trade New South Wales can do as compared with Protectionist Victoria. It appears that some 25 years ago Mr. W. H. Hudson, the father of the present proprietors, commenced business on the present site in a very unpretending manner, his first undertaking of any importance being the building of St. Paul's Church, and afterwards the supply of the woodwork for Sydney University. The business extended; but, owing to most of the material used being imported ready finished, the premises in which it was carried on were not enlarged, so that in 1866, when Henry and Robert took over the father's interests (Mr. William Hudson joined the firm some years afterwards), the area of the works was something under 40 ft. by 30 ft. From this time the progress has been rapid and satisfactory; in the course of three or four years it was found necessary to introduce steam machinery, and a boiler and engine of 12-horse power, previously used by Penell, and believed to be the first made in Sydney, was purchased. Money not being too plentiful at the time, and the carriage of goods very expensive, the engine was taken to pieces and carried piecemeal to the premises. But business still further increased, and probably taxed the energies of the firm to the utmost. Not more than twelve months had elapsed when another outlay was found to be necessary for the purchase of a 25-horse power engine and boiler and shafting; more than this, a planing machine, imported from America, found its way into the shop, and plenty of work was forthcoming to keep this going. Of course, it need hardly be said that during this time the premises were gradually expanding with the increasing business.

The history of the progress of the firm from the introduction less than 10 years ago of a 12-horse engine to the present time, when they can entirely construct a railway wagon in 2 hrs. and 20 min. is particularly interesting; but it will suffice to remark that machinery followed machinery in endless variety, till at the present time there are 11 circular saw-benches, 10 planing and moulding machines, 3 shaping machines for working circular shaped or irregular mouldings, 4 morticing machines, 3 boring machines, 3 tenoning machines, 2 endless band saw machines, 3 glass papering machines, 1 fret scroll machine, 3 machines for sharpening saws, 1 patent universal woodworker, &c. The first contract entered into by Messrs. Hudson with the Government for rolling stock was at the beginning of 1876, when 200 D wagons were required. Ten wagons per month for the first 100, and 15 wagons per month for the second 100, were stipulated for in the conditions. At that time there was not a blacksmith's forge on the premises, nor even one bar of iron, and the site of the present smith's shop was occupied with stacks of timber, all of which had not only to be cleared away, but a shop had to be built in which to carry on the work. A start at blacksmithing was made about March, and soon after an engineers' shop was erected, and fitted with lathes, drills, &c. The first 14 wagons were delivered during May, and the whole of the 200 were completed by the end of the year, which was 11 months under contract time. During their last engagement with the Government for supplying rolling stock the firm turned out no less than 90 D wagons in one month, and this remarkable feat was accomplished in order to meet the demand for the carriage of wool by railway; in fact, from the commencement to the finish of the contract, 300 wagons were supplied in less than four months. The extent of these operations may, perhaps, be better understood by the uninitiated when it is stated that 725,000 lbs. weight of iron and about 300,000 ft. of timber were used in building these wagons, the gross weight of manufactured materials passing through the hands of the workmen amounting to about 1500 tons. Since 1876 there have been built on the establishment 700 wagons, 12 carriages (saloon, first and second class, and composite), 100 cattle, 4 sheep, and 26 coal wagons, and 100 coal skips, altogether amounting in value to something like 76,000. From the latter period the capabilities of the establishment appear to have expanded in proportion to the demands made upon it, and, consequently, shop after shop, machine after machine, were added, until now it is capable of supplying all the rolling stock required for the New South Wales railways.

The Viceregal visit was intended to celebrate the extension on a huge scale of an industry which to a rising colony is of the utmost importance—the manufacture of all kinds of railway rolling stock, except engines. Some few months since Messrs. Hudson, anticipating the requirements of the country, erected extensive workshops, for the purpose of being able to carry out the largest orders likely to be received, and, as a consequence, they have been enabled to secure the contracts recently advertised by the Government for the supply of rolling stock for five years, and which will amount to between 300,000, and 400,000. The works are not only of ample size but are provided with every requisite for speed, good workmanship, and economy. As to speed, it may be observed that a few days previous to the visit 50 sashes, required for the Exhibition, were turned out at an average rate of 7½ minutes each sash; and one matter worth mention in connection with the steam power is that no coal is consumed for the furnaces, the only exception being in the blacksmith's forges—shavings, sawdust, and the general refuse of the workshops are found sufficient for the purpose, and the heat obtained is far in excess of that from coal. The dimensions of the new premises, specially built for carrying out large contracts such as the one just entered into, may be thus stated:—Carriage shop, 220 ft. by 42 ft.; wagon shop, 140 ft. by 70 ft.; and machine shop, 220 ft. by 30 ft. There are already to be seen in this department wagons in various stages of completion, and also the framework of a saloon carriage, built on the American principle. The great feature of the day was the building of a D wagon, in probably the shortest time on record, whether in the colonies or in the Old Country. Work was commenced at 5 minutes after 2 o'clock exactly, the various portions of the wagon being previously prepared and ready for putting together. About a dozen workmen were engaged in the operation, and the scene at once assumed a lively and busy aspect; the noise of hammers and saws soon became extremely lively, but the effect was really wonderful. The first thing done was, of course, to put the framework together, which necessarily requires to be of immense strength. Piece after piece was added, till the work began to assume a definite shape. Once the upper portion was finished and placed on its axle, the painters were soon at work. Each man had his allotted share to perform throughout, and, although there was much bustle, there was no confusion. Bolt after bolt was driven, and everything thoroughly tested, till, at 25 minutes past four o'clock a loud cheering announced that the task undertaken had been successfully accomplished. Mr. Burnett, the locomotive superintendent, then officially examined the wagon, and certified to its having been faithfully

built according to specification. Thus, the whole time occupied in constructing this wagon was 2 hours and 20 minutes exactly—really a wonderful feat, and, as before stated, one which is believed never to have been equalled in any part of the world. This is a fact which speaks volumes for the abilities of the skilled artisans of New South Wales, and proves them to be as good as the very best mechanics in England. The progress of the work was watched with much interest throughout, the scene of operations being thronged with spectators from commencement to finish.

The nature of the gathering will be judged of when it is stated that among those present were—His Excellency Sir Hercules Robinson, G.C.M.G., who was accompanied by Lady Robinson and Mrs. St. John, and the Hon. H. S. Littleton; Sir Alfred Stephen, C.B., K.C.M.G.; Mr. Justice Fawcett, Sir Henry Parkes, K.C.M.G.; Sir John Robertson, K.C.M.G.; the Hon. John Sutherland, Sir Wigram Allen, Sir John Hay, K.C.M.G.; Mr. P. A. Jennings, Mr. C. J. Roberts (the Mayor of Sydney), the Hon. J. J. Casey (the Commissioner from Victoria to the Sydney Exhibition), and a large number of other gentlemen occupying prominent positions in the colony. At the banquet, which concluded the day's proceedings, the usual loyal toasts having been honoured, and the National Anthem played, the Chairman (Mr. Henry Hudson) in proposing the health of the Governor, said that Sir Hercules was unfortunately suffering from indisposition, otherwise he would have had great pleasure in remaining to dinner. His excellency had expressed to him (the Chairman) the satisfaction he had received from his visit, and said he had been taken by surprise at the extent of the establishment, as he had previously had no idea of anything like it existing in the colony. The Governor (said the Chairman), during his period of office, had proved himself a real friend of the people of this colony, the best interests of which he always had at heart. Every one felt that the colony would suffer a great loss when he left it. The toast was marvellously well received.

In responding to the toast of "Her Majesty's Ministers" Sir John Robertson referred to Messrs. Hudson Brothers as perhaps the most enterprising firm in all the colonies in the line of business in which they were engaged. Here we saw young men—a firm consisting wholly of young men—not one of them having arrived at the age of 35, mere boys, rising from very small degrees, with very little means at the commencement, but with fragility, attention to business, and honesty, climbing upwards to such a point as to possess the means to carry out what they desired, and they now saw them raised to the position of people equal to any firm in the line of business in which they were engaged in all the Australias. Mr. Hezlett, J.P.; the Hon. Sir John Hay; Mr. Sutherland, M.L.A.; and Sir Alfred Stephen were among the speakers, and the Chairman, in responding to the toast of "Messrs. Hudson Brothers and Mr. Hudson, senior," remarked that all they could lay claim to was that they had tried to do their work faithfully and well. They could fairly claim that they had never sought to make their profits by scamping their work or pinching those whom they employed. They had looked to other sources—to the aid of machinery as utilising labour, and, although, years ago, it used to be the fashion to condemn machinery, he did not think there was one of the 400 workmen they employed who would get up and say he wished any of those machines away. They felt as he did, that machinery did the drudgery, and that what was chiefly wanted were brains to direct it. It had been their great and good fortune to be aided in all their enterprises by skilful and upright workmen, and they were very proud that a feeling of mutual confidence and common interest had so long existed among them. When rightly understood, the interests of capital and labour were identical, and if by sound judgment they have conducted their industries so as to have kept work in the colony, which otherwise would have been sent abroad, they feel that they had obtained a double reward, the reward which consists not merely in the money profit that might accrue to themselves, but also the reward of knowing that they had contributed to the honour and importance of the colony, and to the comfort and prosperity of a portion of the mechanics of their city. He was asked that day whether the men in New South Wales could do the work as well as they could at home, and he said, "Certainly, why not?" The machines which we have are of the same kind as the machines they use in other parts of the world. We have availed ourselves of the latest and best, and brains are brains, whether they are in New South Wales or anywhere else." If he could find the appliances, he knew very well that they had there men who could direct them. The entire day's proceedings were highly successful, and will, no doubt, do much to prove to the denizens of the neighbouring colonies, and to some of the mistaken individuals at home, the fallacy of protectionist notions, and how much may be done under the enlivening influence of free trade.

CHEMICALS, MINERALS, AND METALS.—Messrs. J. Berger Spence and Co. (May 10)—Alum: Loose lump, 6s. 6d.; ground, 6s. 15s.—Arsenic: Best white powdered, 8s. 15s.—Borax: Refined, English, 36s.—Copperas: Green, 50s. 0d.; white, 8s. 15s.—Copper: Sulphate, 18s. 10s. to 18s. 10s.—Nitrate of Lead, 30s.—Saltpetre: Refined English, 24s. 15s. to 25s.—Sulphate of Zinc, 9s. 0d.;—Sulphur: Roll, 8s. 10s.; flowers, 10s. 10s.—Tin crystals, 5½d. per lb.—White Lead, 20s.—Barytes: Carbonate, 8s.—Brimstone: Best thirds, 5s.—Chiusa-Clay, 38s.—Oxide of Zinc, 22s. 10s.—Talc, 6s.—Umber, 70s.—Charcoal: Best stick, 4½d. per bushel; field burnt, 6d.—Globe Steam-Boiler Powder, 16s. per cwt.—Naphtha, Miscible, 60 per cent., 4s.

HOLLOWAYS' OINTMENT AND PILLS—COUNSEL FOR THE DELICATE.—Those to whom the winter is a protracted period of trial should seek the earliest opportunity of removing all obstacles to good health on the return of spring. This cooling ointment, perseveringly rubbed upon the skin, is the most reliable remedy for overcoming all diseases of the throat and chest, swollen glands, ordinary catarrh, and bronchitis usually prevailing at this season may be arrested as soon as discovered, and every symptom banished by Holloway's simple and effective treatment. The ointment and pills are highly commended for the facility with which they treat such affections with influenza; they allay in an incredibly short time the distressing fever and teasing cough.

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100 specimens, in cabinet, with 3 trays	£2 2 0
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GOLD AND SILVER MEDALS AWARDED for Steam-Engines & Boilers, also the Special Steam Pump, with Holman's Condenser & Compound Pumping Engine.



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The "SPECIAL" DIRECT-ACTING STEAM PUMP,

Holman's Patent Self-acting Exhaust Steam Condensers.

UPWARDS OF 12,000 "SPECIAL" STEAM PUMPS ARE IN USE.

After eight years of successful application for all purposes to which steam-driven pumps can be applied, THE "SPECIAL" STEAM PUMP STILL MAINTAINS THE FIRST POSITION IN THE MARKET, notwithstanding that it alone—of all direct-acting pumps—has been subjected to the great variety of severe tests that must be encountered in such a period of time. Some valuable improvements have been suggested in the course of a long experience, and their adoption has rendered the apparatus at once the simplest and most certain in action. There is absolutely no extraneous gear, and the steam cylinder is no longer than the pump. The valves are of easy access, and are suited for pumping fluids and semi-fluids of almost any consistency.

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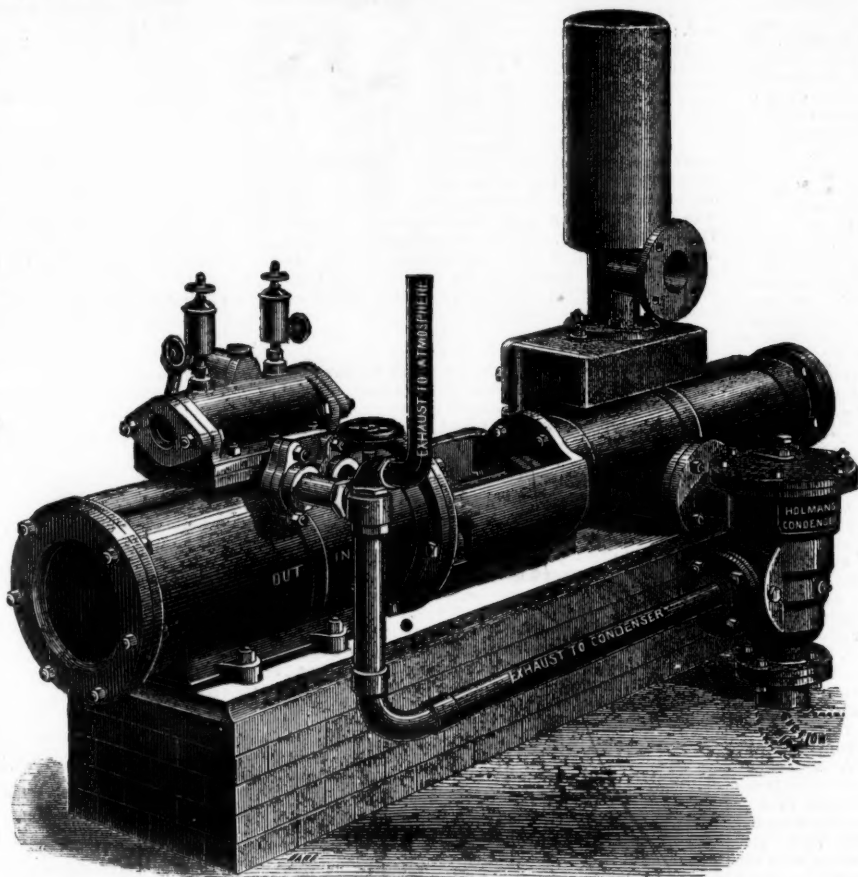
Turns waste steam into GREAT POWER.

Saves half its cost in pipes and connections.

Prevents all escape of steam in mines or elsewhere.

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WILLIAM ELLIOT, Esq., of the Weardale Iron and Coal Company, writes under date Sept. 17th, 1875, as follows:—"We have now THIRTY-FIVE of your SPECIAL STEAM PUMPS in operation at the various collieries under my charge—some of them employed pumping water out of our pits to the depth of 50 fms.—others employed in the pits, and a good many feeding Boilers. I have no hesitation in saying that we have found them the Cheapest and Best Pumps of the kind we have tried. I can with confidence recommend them to intending purchasers."

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Are made to suit any size and kind of Steam Pump. They form a part of the suction pipe of the Pump, and while they effectually condense the exhaust steam they produce an average vacuum of 10 lbs. per square inch on the steam piston, increasing the duty of the Engine and effecting a saving in fuel of from 20 to per cent.

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All Boiler Feeders are recommended to be fitted with these Condensers, as not only is the exhaust steam utilised in heating the feed water, but is returned with it into the boiler.

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The following sizes are suitable for low and medium lifts:—

Diameter of Steam Cylinder...In.	3	4	4	4	5	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10
Diameter of Water Cylinder...In.	1½	2	3	4	3	4	5	3	4	5	6	3	4	5	6	7	4	5	6	7	8	5	6	7	8	9	5	6
Length of Stroke.....In.	9	9	9	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	18	12	12	12	18	24	12	12
Gallons per hour	680	815	1830	3250	1830	3250	5070	1830	3250	5070	7330	1830	3250	5070	7330	9750	3250	5070	7330	9750	13,000	5070	7330	9750	13,000	16,500	5070	7330
Price of Special Pump...£	16	18	20	25	22	10	27	10	32	10	25	30	35	40	30	35	40	45	50	40	45	50	55	65	50	55	60	70
Extra, if fitted with Holman's Condenser and Blow-through Valve	£7	£7	£9	£11	£8	10	£11	10s	£12	10s	£9	£12	£15	£15	£10	£13	£15	£16	£22	£13	£16	£16	£22	£22	£16	£16	£23	£24

CONTINUED.

Diameter of Steam Cylinder..In.	10	10	10	10	12	12	12	12	12	12	14	14	14	14	14	14	16	16	16	16	16	18	18	18	18
Diameter of Water Cylinder..In.	7	8	9	10	6	7	8	9	10	12	7	8	9	10	12	14	8	9	10	12	14	9	10	12	14
Length of StrokeIn.	12	18	24	24	18	18	18	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Gallons per hour	9750	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	30,000	9750	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000	16,519	20,000	30,000	40,000
Price of Special Pump..£	65	75	90	100	75	80	85	110	120	140	110	120	130	140	160	180	140	150	160	180	200	180	190	210	230
Extra, if fitted with Holman's Condenser and Blow-through Valve	£23	£24	£35	£35	£20	£27	£27	£38	£38	£50	£28	£28	£40	£40	£55	£55	£28	£40	£40	£55	£55	£45	£45	£56	£60

Intending purchasers of Steam Pumps would do well to observe the great length of stroke, short steam cylinder, and short piston of the "Special" Steam Pump, as compared with the short stroke, long steam cylinder, and long piston of the Pumps of other makers, as the efficiency and durability of the machine, and the space occupied by same, greatly depend upon this. The advantage of long strokes will be obvious when purchasers are reminded that each set of suction and delivery valves of a "Special" Steam Pump with 24 in. stroke, running at 120 ft. per minute, would open and close only 30 times per minute, as against 120 times per minute in a Pump with only 6 in. stroke performing same duty.

The "Special" Steam Pump can be worked by Compressed Air as well as by Steam.

HUNDREDS of these PUMPS are USED for HIGH LIFTS IN MINES, for which purpose they are made with 21, 24, 26, 28, 30, and 32-inch Steam Cylinders, and 36 48 and 72-inch Strokes

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Messrs. TANGYE BROTHERS AND HOLMAN.

GENTLEMEN,—I have great pleasure in recording my entire satisfaction with the working of the Holman's Patent Steam Pump Condenser which you have supplied to us. The complete condensation of the steam is, apart from its value in the brief economic sense, a most valuable feature in the drainage of underground work.

ings. The perfect manner in which this important result is accomplished by your Condenser is extremely creditable to you, and merits the thanks and commendation of the Mining Engineer. When we start the "Special" Steam Pump the Condenser commences working automatically, and maintains a constant vacuum of 10½ lbs. per square inch, even when we run the Pump upwards of 80 strokes (106 feet) per minute. It may perhaps be interesting to you to know that when we were running the Pump at 64 strokes (166 feet) per minute, the steam gauge

indicating a steam pressure of 36 lbs. per square inch, 80 yards from the Pump and the Condenser vacuum gauge on the exhaust pipe indicating a steady vacuum of 21½ inches, I turned the exhaust steam from the Condenser into the atmosphere, when the speed at once fell to 44 strokes per minute. The working economy thus shown is really so great that the cost of the Condenser must be saved in a very short time.

(Signed) J. THOMPSON.

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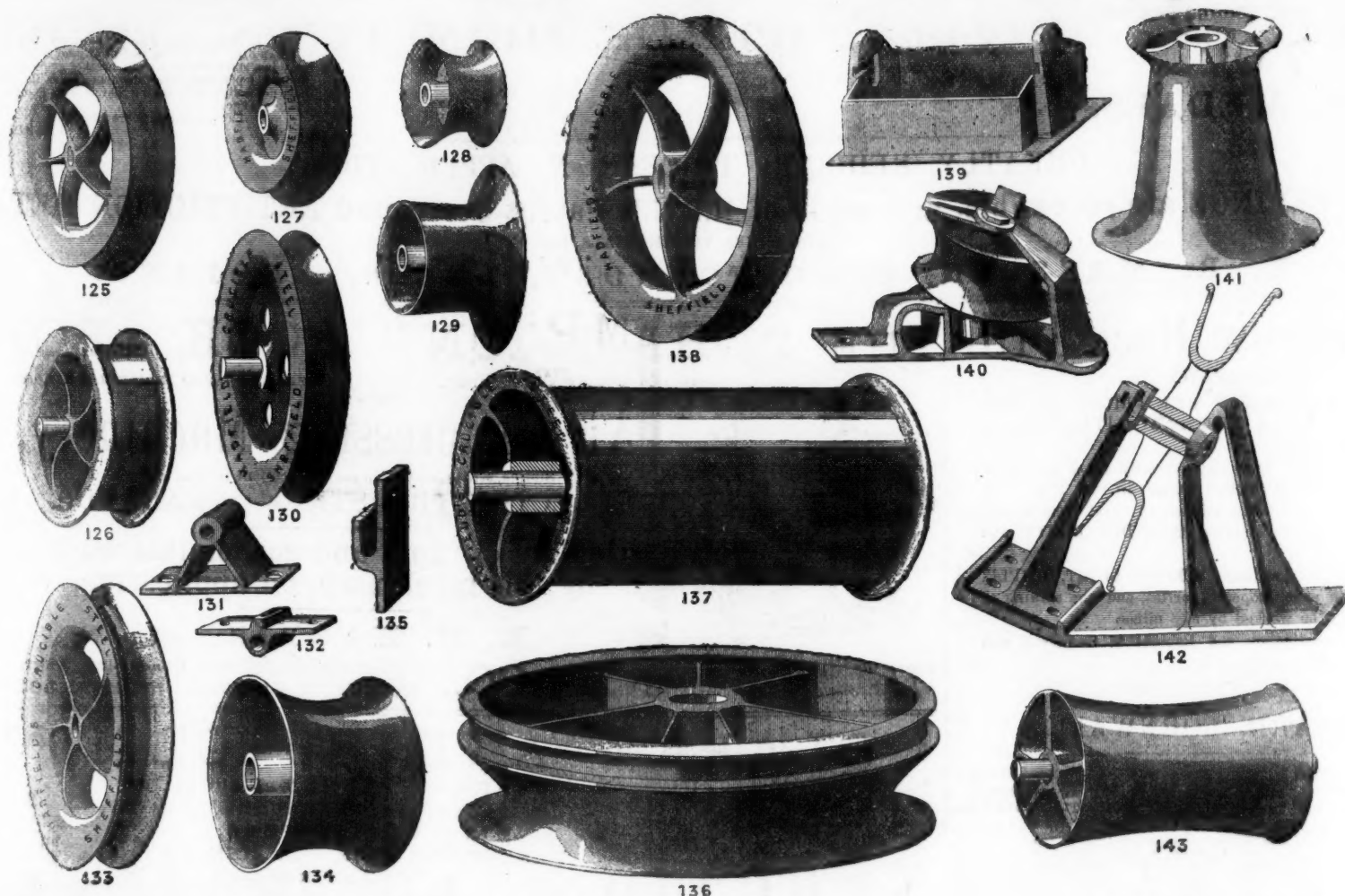


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ATTERCLIFFE, SHEFFIELD,
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CRUCIBLE STEEL CASTINGS,
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Hadfield's Steel Rollers and Pulleys.



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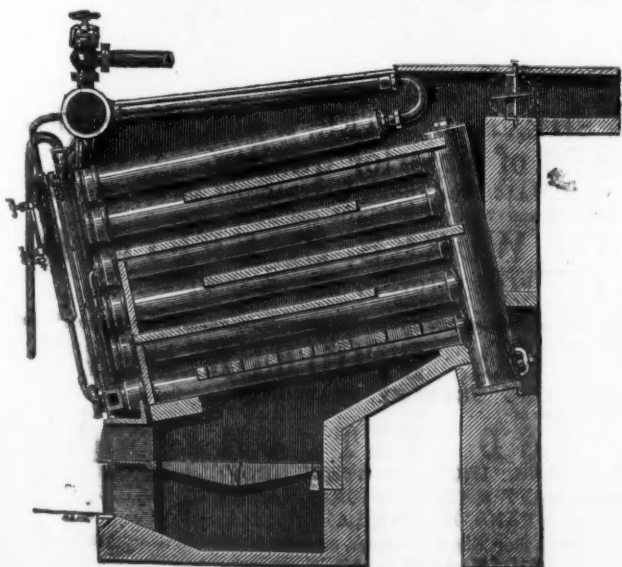
The following are some of the advantages claimed by the above Rollers and Pulleys:—
1.—**LIGHTNESS.**—They are cast by us from one-third to one-half lighter than cast-iron.
2.—**SAVING OF HAULAGE POWER AND WIRE ROPES.**—Our Pulleys and Rollers, being extremely light, they effect a great saving in haulage power, and considerably prolong the life of wire ropes. As our Rollers and Pulleys are equally balanced, and never lopsided, the instant the rope or chain touches they readily revolve, and all grinding or sawing by the rope is avoided.
3.—**STRENGTH.**—Although extremely light they cannot be broken by ordinary means—say by the sudden passing of chains over them such as frequently connect the rope to the wagon, or hang loose from the end of the passing wagons.
4.—**DURABILITY.**—One of our Crucible Steel Rollers or Pulleys will outlast about TWELVE IRON ONES.
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The Boilers are constructed of the very best material, combined with the most careful workmanship, every Boiler being tested to 300 lbs. per square inch, and made absolutely tight and perfect before leaving the company's works.

Each Boiler, in addition, is sold with the certificate of the Inspecting Engineer of one of the first Boiler Insurance Companies in the country.

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BARROW-IN-FURNESS.



By a special method of preparation, this leather is made solid, perfectly close texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

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HOPTON'S CONVERSATIONS ON MINES, between Father and Son. The additions to the work are near 80 pages of useful information, principally questions and answers, with a view to assist applicants intending to pass an examination as mine managers, together with tables, rules of measurement, and other information on the moving and propelling power of ventilation, a subject which has caused so much controversy.

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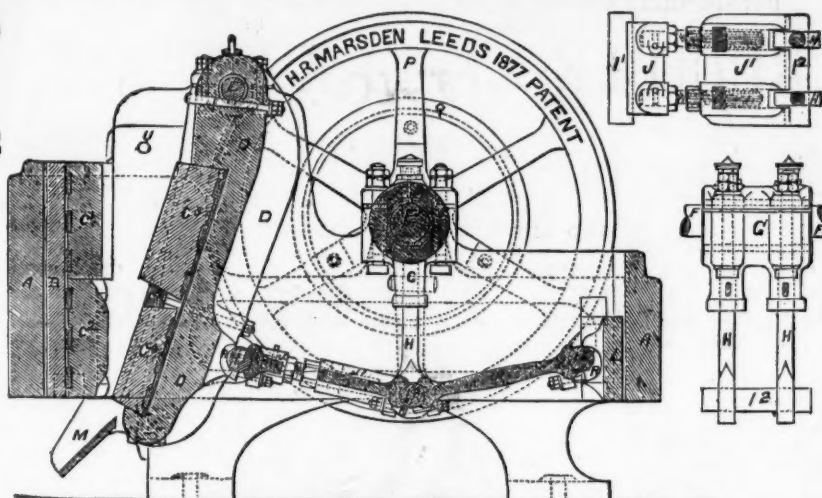
At the PARIS EXHIBITION the Jurors have Awarded

THE GOLD MEDAL, THE SILVER MEDAL, AND HONOURABLE MENTION
FOR MY LATEST PATENTED STONE BREAKERS AND ORE CRUSHERS.

Stones broken equal, and Ores better, than by hand, at one-tenth the cost.

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Improved Patent Stone Breakers & Ore Crushers.**New Patent Reversible Jaws,
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TOGGLES.****OVER 2500 IN USE.****New Patent Draw-back
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Wharfedale Lime Works, Maryport, Whitehaven,
November 7, 1878.
H. R. MARSDEN, Esq., Soho Foundry, Meadow-lane, Leeds.
DEAR SIR,—The machine I have in use is one of the large
size, 34 in. by 13 in. The quantity we are breaking daily with
this one machine is 350 tons, the jaw being set to break to a
size of 2½ in. We have, however, frequently broken over
300 tons per day of ten hours, and on several occasions over
350 tons during the same period. The stone we break is the
blue mountain limestone, and is used as a flux in the various
ironworks in this district. We have now had this machine in
daily use for over two years without repairs of any kind, and
have never had occasion to complain of any inconvenience in
using the machine. I hope the one you are now making for
me may do its work equally well. The cost—including EN-
GINE-POWER, COALS, ENGINEMAN, FREEDING, and all EXPENSES
OF EVERY KIND—is just 3d. per ton. Should any of your
friends feel desirous of seeing one of your machines at work,
I shall have much pleasure in showing the one alluded to.
I am, dear Sir, yours very truly,
WILLIAM MILLER.

AND THIS—

Wharfedale Lime Works, Aspatria, Cumberland,
July 11th, 1878.
H. R. MARSDEN, Esq., Soho Foundry, Leeds.
DEAR SIR,—We are in receipt of your letter of 4th inst. I
may just state that the stone breaker above named has been
under my personal superintendence since its erection, and I
have no hesitation in saying that it is as good now as it was
five years ago.
I am, dear Sir, yours faithfully,
FRANCIS GOULD.

GREATLY REDUCED PRICES ON APPLICATION.

ALL BEARINGS are renewable, and made of H.R.M.'s Patent Compound ANTIFRICTION METAL.

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COMPANYSUPPLY their CELEBRATED ROCK DRILLS, AIR COM-
PRESSORS, &c., and all NECESSARY APPLIANCES for
working the said Drills.Their DRILLS have most satisfactorily stood the TEST
of LONG and CONTINUOUS WORK in the HARDEST
KNOWN ROCK in numerous mines in Great Britain and
other countries, clearly proving their DURABILITY and
POWER.The DRILLS are exceedingly STRONG, LIGHT, SIMPLE,
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Economical Working, apply to—**LOAM AND SON,
LISKEARD, CORNWALL.****BICKFORD'S PATENT
FOR CONVEYING
CHARGE IN****SAFETY FUSE
FIRE TO THE
BLASTING ROCKS &c.**

Obtained the PRIZE MEDALS at the "ROYAL EXHIBITION" of 1861; at
the "INTERNATIONAL EXHIBITION" of 1862 and 1874, in London; at the
"IMPERIAL EXPOSITION," held in Paris, in 1865; at the "INTERNA-
TIONAL EXHIBITION," in Dublin, 1865; at the "UNIVERSAL EXPOSI-
TION," in Paris, 1867; at the "GREAT INDUSTRIAL EXHIBITION," at Al-
ton, in 1869; TWO MEDALS at the "UNIVERSAL EXHIBITION," Vienna,
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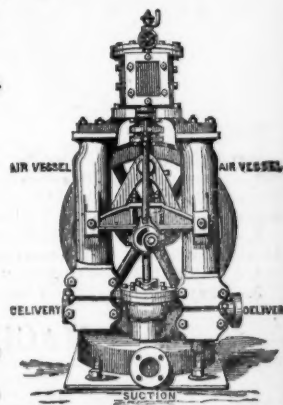
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